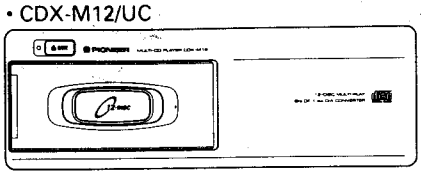
PIONEER
The Art of Entertainment

Service Manual

• CDX-M12/UC



ORDER NO.
CRT1521

MULTI-COMPACT DISC PLAYER

CDX-M12

UC, EW

COMPACT disc DIGITAL AUDIO

●See the separate manual CX-612 (CRT1518) for the CD mechanism description.

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SPECIFICATIONS

General

System ..... Compact disc audio system
Usable discs ..... Compact Disc
Signal format ..... Sampling frequency: 44.1 kHz
Number of quantisation bits: 16; linear
Power source ..... 14.4 V DC (10.8 — 15.6 V allowable)
Max. current consumption ..... 0.9 A
Weight ..... 2.8 kg (6.2 lbs.)
Dimensions ..... 275 (W) × 93 (H) × 168 (D) mm
[10-7/8 (W) × 3-5/8 (H) × 6-5/8 (D) in.]

Audio

Frequency characteristics ..... 5 — 20,000 Hz (±1 dB)
Signal-to-noise ratio . 97 dB (1 kHz) (IHF-A Network)(UC)
97 dB (1 kHz) (IEC-A Network)(EW)
Dynamic range ..... 94 dB (1 kHz)
Output level ..... 500 mV (1 kHz, 0 dB)
Number of channels ..... 2 (stereo)

Note:
Specifications and the design are subject to possible modification without prior notice due to improvements.

●CD Player Service Precautions

1. Since these screws protects the mechanism during transport, be sure to affix it when it is transported for repair, etc.
2. For pick-up unit handling, please refer to "Disassembly". During replacement, handling precautions shall be taken to prevent an electrostatic discharge (protection by a short pin).
3. During disassembly, be sure to turn the power off since an internal IC might be destroyed when a connector is plugged or unplugged.

PIONEER ELECTRONIC CORPORATION 4-1,Meguro 1-Chome,Meguro-ku,Tokyo 153,Japan
PIONEER ELECTRONICS SERVICE INC. P.O.Box 1760,Long Beach,California 90801 U.S.A.
PIONEER ELECTRONICS OF CANADA, INC. 300 Allstate Parkway Markham,Ontario L3R 0P2 Canada
PIONEER ELECTRONIC [EUROPE] N.V. Haven 1087 Keetberglaan 1,9120 Melsele,Belgium
PIONEER ELECTRONICS AUSTRALIA PTY.LTD. 178-184 Boundary Road,Braeside,Victoria 3195,Australia TEL:[03]580-9911

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1. SAFETY INFORMATION

1.1 CDX-M12/EW

1. Safety Precautions for those who Service this Unit.

- **Follow the adjustment steps (see pages 7 through 25)in the service manual when servicing this unit. When checking or adjusting the emitting power of the laser diode exercise caution in order to get safe, reliable results.**

Caution:

1. During repair or tests, minimum distance of 13cm from the focus lens must be kept.
2. During repair or tests, do not view laser beam for 10 seconds or longer.

2. A "CLASS 1 LASER PRODUCT" label is affixed to the rear of the player.

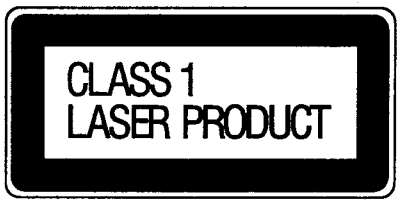


Fig.1

3. The triangular label is attached to the mechanism unit frame.

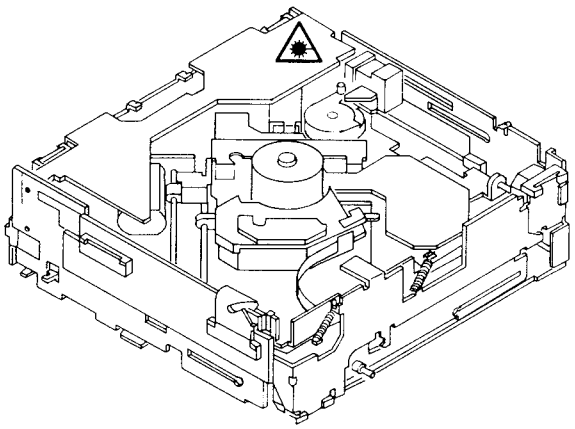


Fig.2

4. Specifications of Laser Diode

Specifications of laser radiation fields to which human access is possible during service.
Wavelength = 785 nanometers
Radiant power = 69.7 microwatts(Through a circular aperture stop having a diameter of 80 millimeters)
0.55 microwatts(Through a circular aperture stop having a diameter of 7 millimeters)

1.2 CDX-M12/UC

CAUTION

This service manual is intended for qualified service technicians; it is not meant for the casual do-it-yourselfer.
Qualified technicians have the necessary test equipment and tools, and have been trained to properly and safely repair complex products such as those covered by this manual.
Improperly performed repairs can adversely affect the safety and reliability of the product and may void the warranty.
If you are not qualified to perform the repair of this product properly and safely; you should not risk trying to do so and refer the repair to a qualified service technician.

WARNING

Lead in solder used in this product is listed by the California Health and Welfare agency as a known reproductive toxicant which may cause birth defects or other reproductive harm (California Health & Safety Code, Section 25249.5).
When servicing or handling circuit boards and other components which contain lead in solder, avoid unprotected skin contact with the solder. Also, when soldering do not inhale any smoke or fumes produced.

2. DISASSEMBLY

●Case
1.Unfasten six screws A and then remove the upper case.
2.Unfasten four screws B and then remove the lower case.

●Grille Assy
1.Unlock four catches and dismount the grille assy.

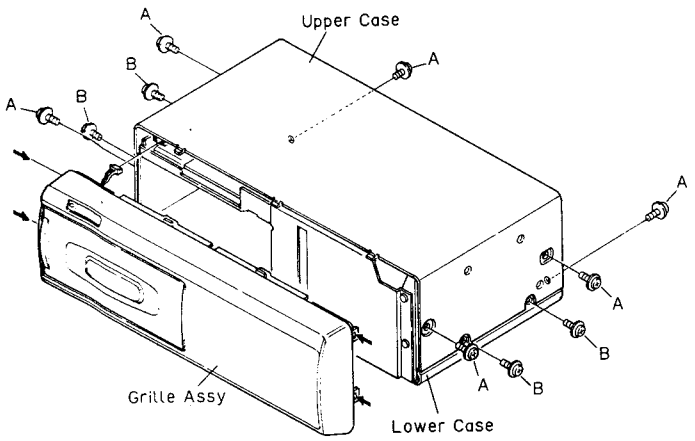


Fig.3

●Bracket L,R
1.Unfasten eight screws.
2.Remove bracket L.
3.Remove bracket R.

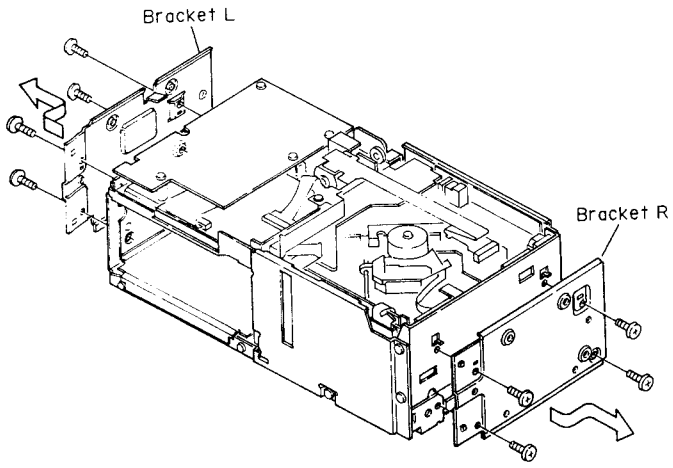


Fig.4

●Extension P.C.Board
1.Unfasten five screws.
2.Remove the connector.
3.Remove the extension P.C.Board.
NOTE:
Be sure to screw in order of 1-5.

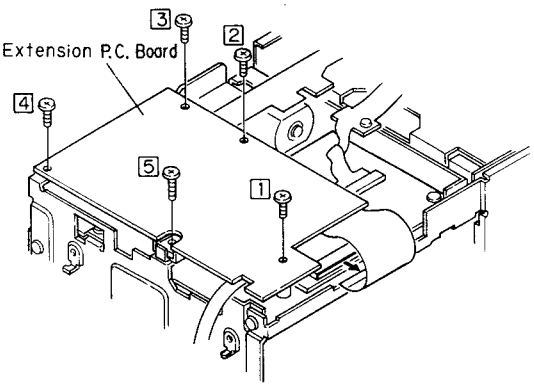


Fig.5

●CN351
Before disconnecting the CN351 connector (PU unit connector), attach a short pin as illustrated.

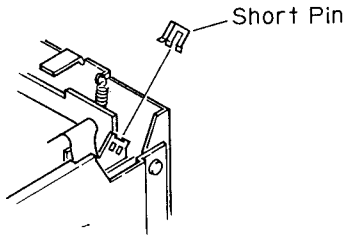


Fig.6

●Main Unit
1.Unfasten four screws.
2.Remove the three connectors.
3.Remove the main unit.
NOTE:
Be sure to screw in order of 1-4.

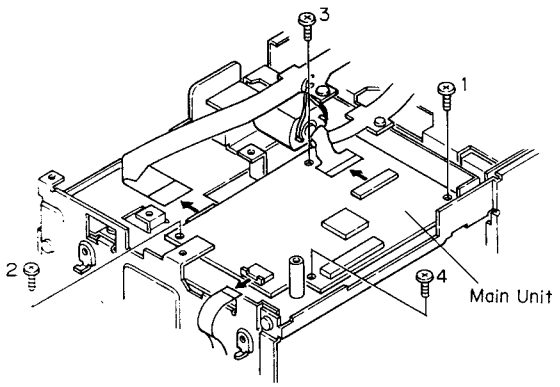


Fig.7

4. ADJUSTMENT

1) Precautions

- This unit uses a single power supply (+5V) for the regulator. The signal reference potential, therefore, is connected to REFOUT (approx. 2.5V) instead of GND.
  If REFOUT and GND are connected to each other by mistake during adjustments, not only will it be impossible to measure the potential correctly, but the servo will malfunction and a severe shock will be applied to the pick-up. To avoid this, take special note of the following.
  Do not connect the negative probe of the measuring equipment to REFOUT and GND together. It is especially important not to connect the channel 1 negative probe of the oscilloscope to REFOUT with the channel 2 negative probe connected to GND.
  And since the frame of the measuring instrument is usually at the same potential as the negative probe,change the frame of the measuring instrument to floating status.
  If by accident REFOUT comes in contact with GND, immediately switch the regulator or power OFF.
- Always make sure the regulator is OFF when connecting and disconnecting the various filters and wiring required for measurements.
- Before proceeding to further adjustments and measurements after switching regulator ON, let the player run for about one minute to allow the circuits to stabilize.
- Since the protective systems in the unit's software are rendered inoperative in test mode, be very careful to avoid mechanical and / or electrical shocks to the system when making adjustment.
- When loading and unloading discs during adjustment procedures, always wait for the disc to be properly clamped or ejected before pressing the another key. Otherwise, there is risk of the actuator being destroyed.
- Turn power off when pressing the button ⏭ or the button ⏮ key for focus search in the test mode. (Or else lens may stick and the actuator may be damaged.)

2) Test mode

The model CDX-M12 is adjusted in a combination with the multiple CD control head (FH-M75, FH-M70, DEH-M980RDS, etc.). Each regulator key should be operated at the head. With the FH-M75,M70 taken up for reference, a description will be given below concerning how to enter into the test mode, including key operations. The key in the adjustment text is also one of the FH-M75, M70 keys.

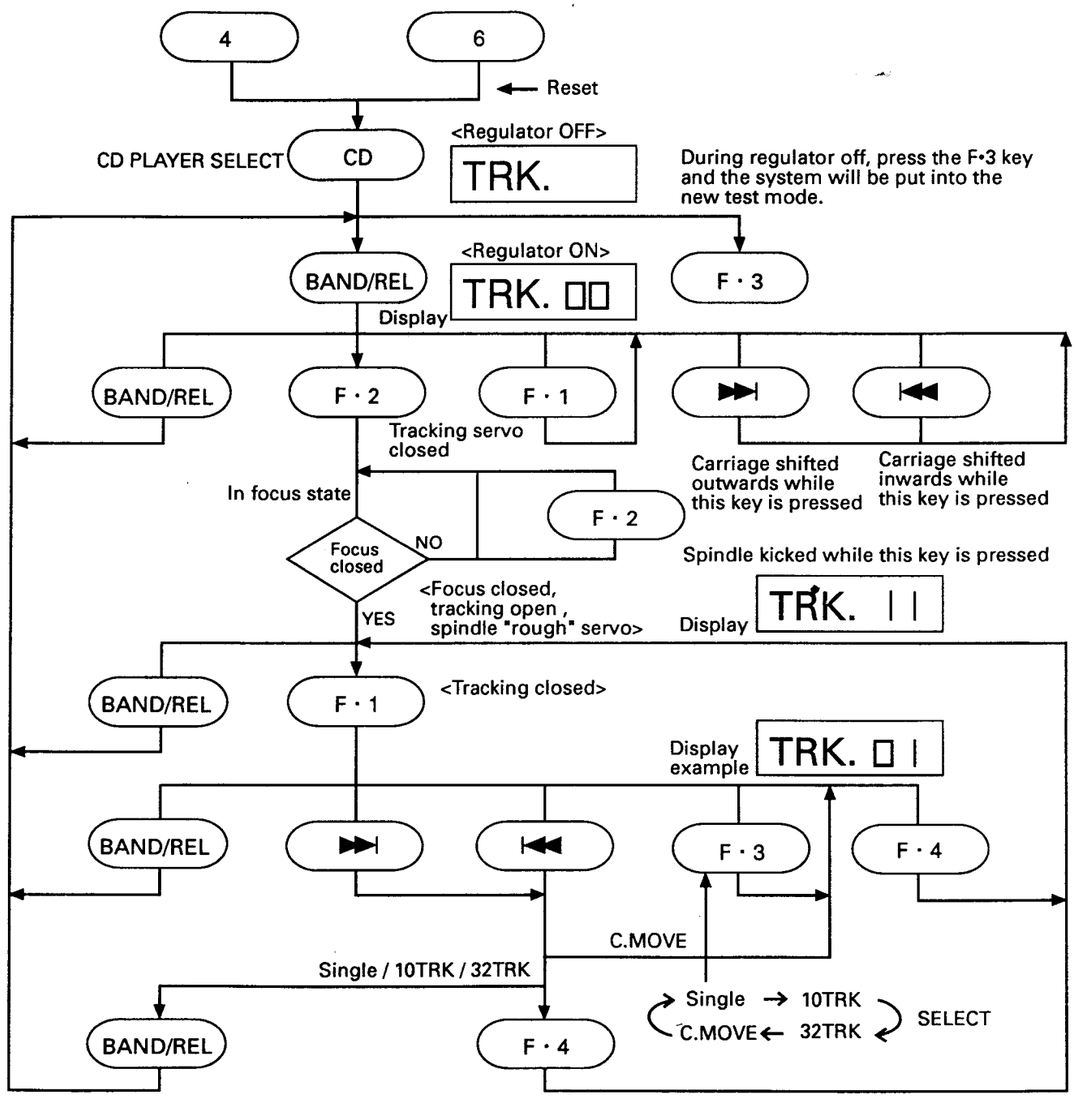
- How to enter into the test mode
  While pressing keys 4 and 6 at a time, press the back-up ON or clear button ON the FH-M75, M70.
- Resetting the test mode
  Press the clear button ON the FH-M75, M70. Subsequently press the clear button ON the CDX-M12. Or turn off the CDX-M12 and the FH-M75, M70 back-up and wait for about one minute.
- Role to be played by each key in the test mode

A function key permits you to select the CD multi-player or single CD player.

Key	Function
BAND/REL	RegulatorON/OFF
⏭	FWD Kick
⏮	REV Kick
EJECT	EJECT
F•3	Jump mode
F•1	Tracking close
F•4	Tracking open
F•2	Focus close
CD	CD ON/OFF

- SINGLE/10TRK/32TRK will continue to operate even after the key is released. Tracking closed the moment C-MOVE is released.
- JUMP MODE resets to SINGLE as soon as power is off.

●Flow Chart



3. BLOCK DIAGRAM

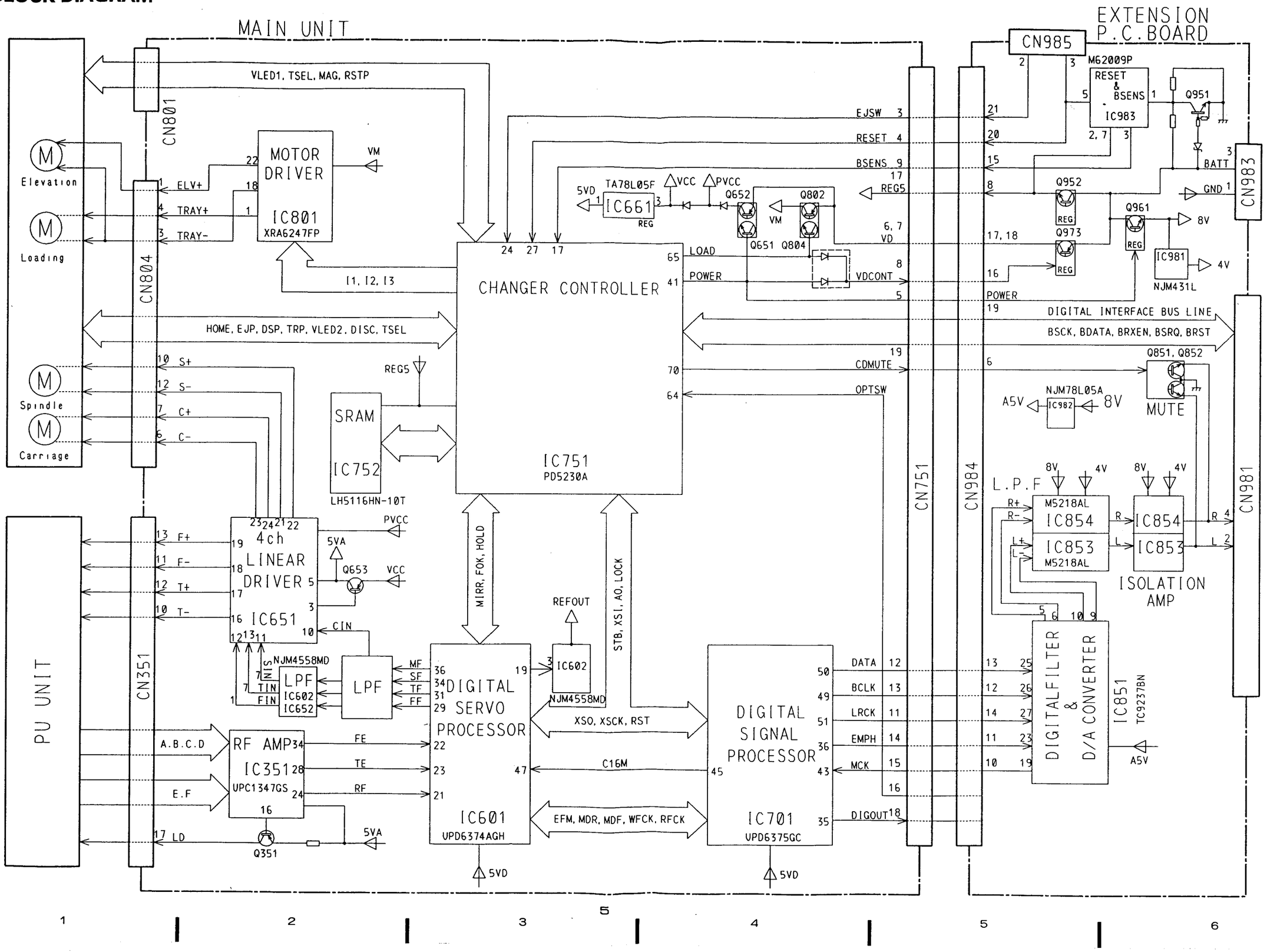


Fig. 8

● **Measuring Equipment and Jigs**

Adjustment	• Measuring equipment&jigs
1. Grating Adjustment-1 (Rough adjustment)	• Oscilloscope, clock driver, grating adjustment filter (bandpass filter)(GGF-133), AC milli-voltmeter • SONY TYPE 4 (or ABEX TCD-782) • Extension Cable:GGD1023 • DIN Cord:GGF1159
2. Tangential Skew Check	• Oscilloscope, screwdriver • SONY TYPE 4 (or ABEX TCD-782) • Extension Cable:GGD1023 • DIN Cord:GGF1159
3. Grating Adjustment-1 (Fine adjustment)	• Oscilloscope, clock driver, two low-pass filters • SONY TYPE 4 (or ABEX TCD-782) • Extension Cable:GGD1023 • DIN Cord:GGF1159
4. Grating Adjustment-2	• Oscilloscope, grating adjustment driver, low-pass filter • SONY TYPE 4 (or ABEX TCD-782) • Extension Cable:GGD1023 • DIN Cord:GGF1159
5. FE Bias Adjustment	• Oscilloscope, volume adjustment driver • SONY TYPE 4 (or ABEX TCD-782) • Extension Cable:GGD1023 • DIN Cord:GGF1159
6. RF Offset Adjustment	• Oscilloscope, volume adjustment driver • SONY TYPE 4 (or ABEX TCD-782) • Extension Cable:GGD1023 • DIN Cord:GGF1159
7. TE Offset Adjustment-1	• DC voltmeter or oscilloscope, volume adjustment driver • Extension Cable:GGD1023 • DIN Cord:GGF1159
8. Tracking Balance Adjustment-1	• Oscilloscope, volume adjustment driver • SONY TYPE 4 (or ABEX TCD-782) • Extension Cable:GGD1023 • DIN Cord:GGF1159
9. Focus Servo Loop Gain Adjustment-1	• Oscillator, gain adjustment filter (GGF-065), oscilloscope, dual meter milli-voltmeter, volume adjustment driver • SONY TYPE 4 (or ABEX TCD-782) • Extension Cable:GGD1023 • DIN Cord:GGF1159
10. Focus Servo Loop Gain Adjustment-2	• Oscillator, gain adjustment filter, oscilloscope, volume adjustment driver • SONY TYPE 4 (or ABEX TCD-782) • Extension Cable:GGD1023 • DIN Cord:GGF1159
11. Tracking Servo Loop Gain Adjustment-1	• Oscillator, gain adjustment filter (GGF-065), oscilloscope, dual meter milli-voltmeter, volume adjustment driver • SONY TYPE 4 (or ABEX TCD-782) • Extension Cable:GGD1023 • DIN Cord:GGF1159
12. Tracking Servo Loop Gain Adjustment-2	• Oscillator, gain adjustment filter, oscilloscope, volume adjustment driver • SONY TYPE 4 (or ABEX TCD-782) • Extension Cable:GGD1023 • DIN Cord:GGF1159
13. TE Offset Adjustment-2	• DC voltmeter or oscilloscope, volume adjustment driver • Extension Cable:GGD1023 • DIN Cord:GGF1159

Adjustment	• Measuring equipment&jigs
14. Checking FEY Level	• Oscilloscope • SONY TYPE 4 (or ABEX TCD-782) • Extension Cable:GGD1023 • DIN Cord:GGF1159
15. Tracking Balance Adjustment-2 And Checking TEY Level	• Oscilloscope, volume adjustment driver • SONY TYPE 4 (or ABEX TCD-782) • Extension Cable:GGD1023 • DIN Cord:GGF1159

●Adjustment Points

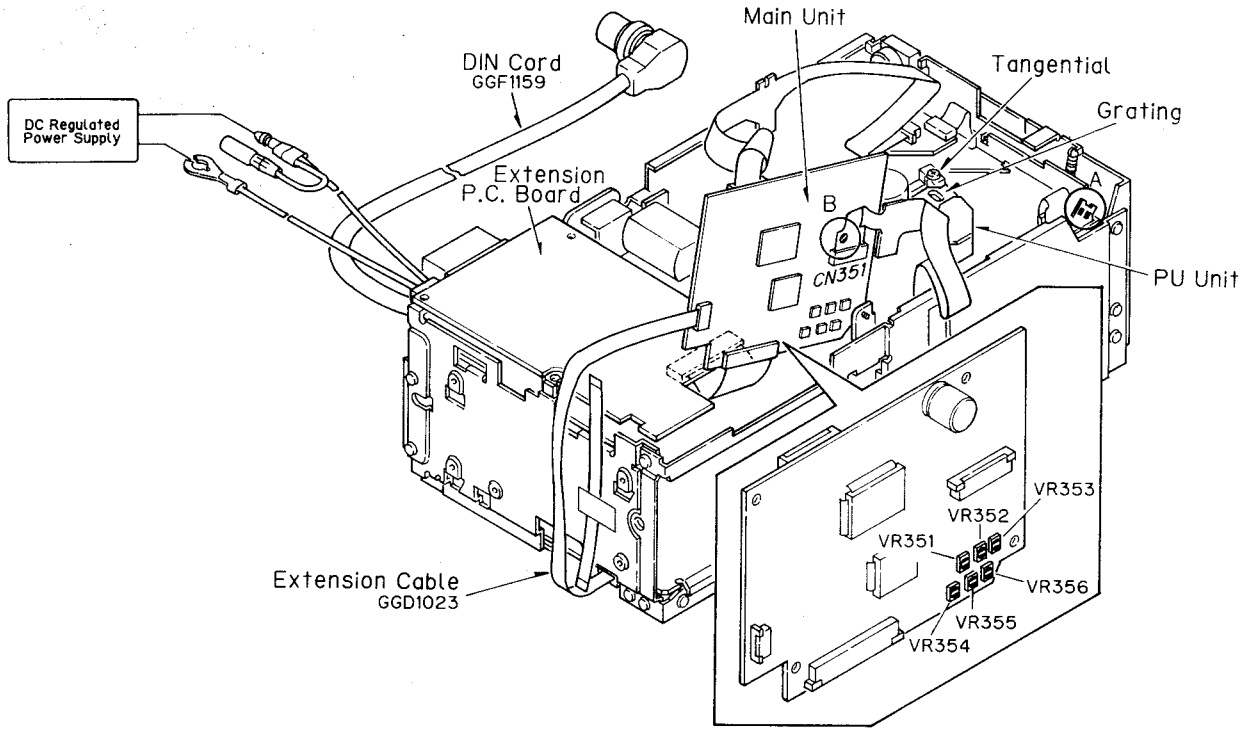


Fig. 9

VR351	FE BIAS
VR352	RF OFFSET
VR353	TE OFFSET
VR354	TRACKING BALANCE
VR355	FOCUS SERVO LOOP GAIN
VR356	TRACKING SERVO LOOP GAIN

Note: When pulling out the connector CN351, be sure to install a short pin in section A. Alternatively, the land in section B may be short-circuited (by soldering or the like). When the connector is insterted, be sure to disconnect it before the power is turned on.

●Test Point

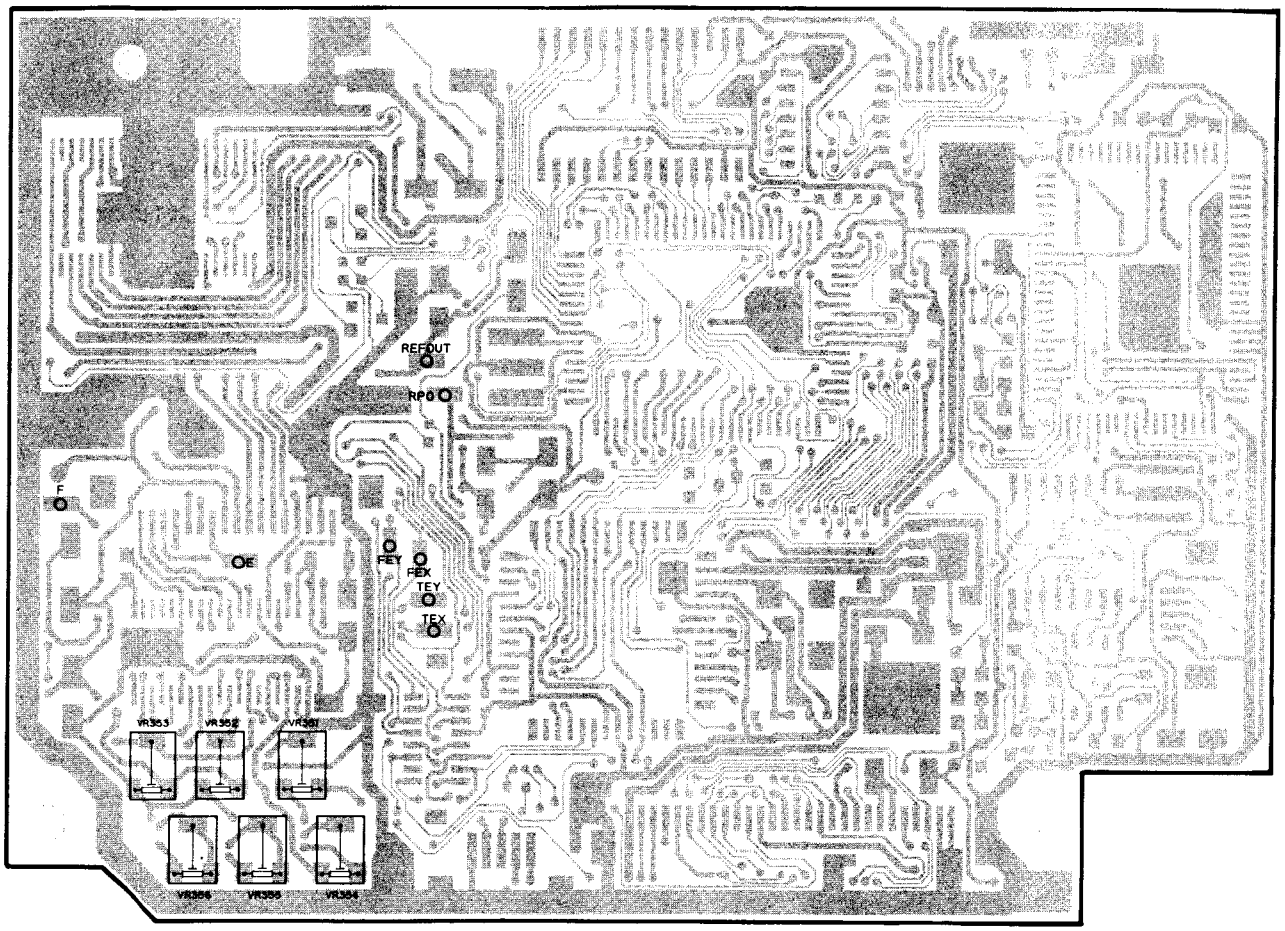
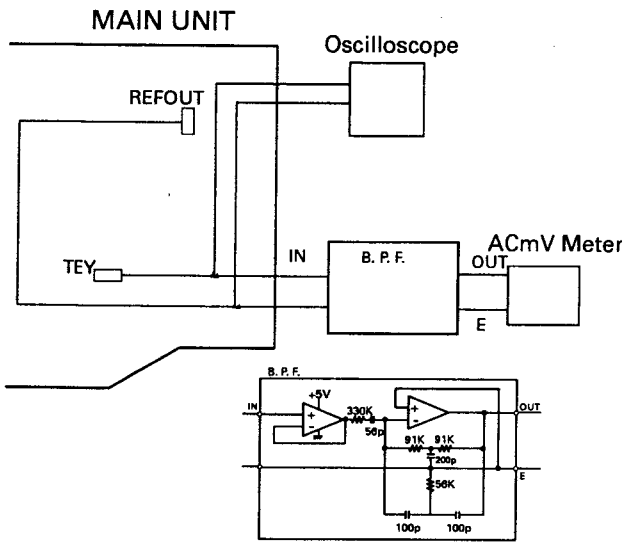


Fig. 10

1 Grating Adjustment-1 (Rough adjustment)

- Grating Adjustment-1 (rough adjustment and fine adjustment) may be performed in Grating Adjustment-2.
- **Purpose:**
  The grating may need adjustment in a replaced pick-up unit.
- **Maladjustment symptoms:**
  No disc playback, track jumping.

- **Measuring equipment / jigs:**
  Oscilloscope, clock driver, grating adjustment filter (bandpass filter) (GGF-133), AC milli-voltmeter
- **Measuring point:**
  TEY
- **Test disc and setting:**
  SONY TYPE 4 (or ABEX TCD-782) Test mode
- **Adjustment position:**
  Pick-up grating adjustment hole



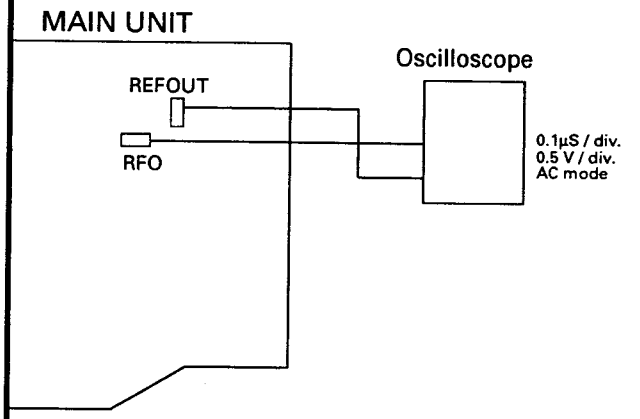
Adjustment Procedure

1. In the test mode, set a test disc-loaded magazine and select the tray with a test disc.
2. Switch regulator ON .
3. Using the ▶▶| or |◀◀ key, move the pick-up to about the center of the test disc.
4. Press the **F•2** key to close focus.
5. While monitoring the TEY filter output by AC milli-voltmeter, turn the grating adjustment hole slowly.The AC voltage increases and decreases while turning the screw. Search for the minimum voltage level. (This corresponds to the position where the grating is on a track, and is referred to as the null point.)
6. Then while monitoring TEY by oscilloscope, turn the driver slowly clockwise from the null point (as seen from under the pick-up) until the first wave-form peak amplitude is reached.

2 Tangential Skew Check

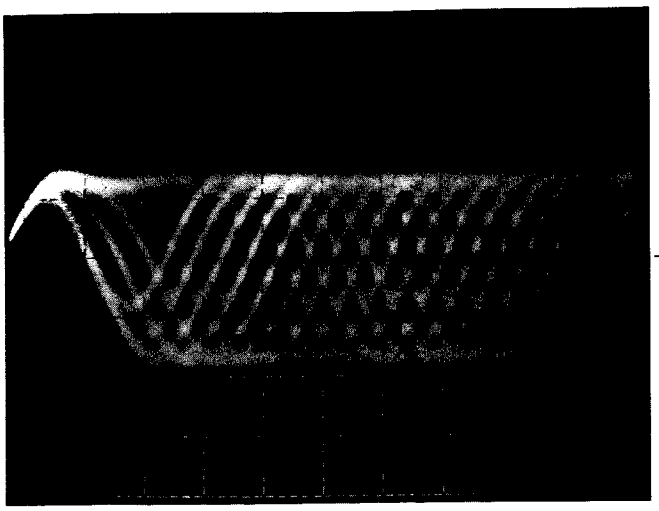
- **Purpose:**
  To check whether tangential skew has been misaligned or not when replacing the pick-up unit.
- **Maladjustment symptoms:**
  No disc playback, track jumping.

- **Measuring equipment / jigs:**
  Oscillosope, screwdriver
- **Measuring point:**
  RFO
- **Test disc and setting:**
  SONY TYPE 4 (or ABEX TCD-782) Normal mode
- **Adjustment position:**
  Pick-up tangential adjustment screw



Adjustment Procedure

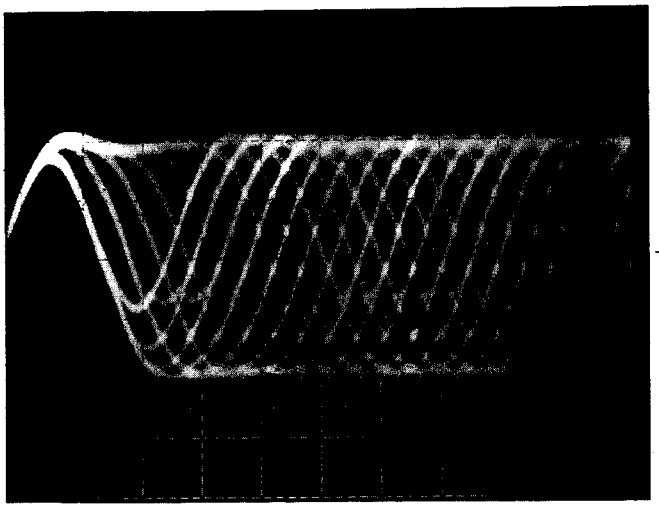
1. Play tune TNO 12 in normal mode. (ABEX TCD-782:TNO19)
2. Adjust the tangential adjustment screw so that the RF wave-form will have a level maximized and an eye pattern clearly viewed. Turn the adjustment screw both clockwise and counterclockwise to points where the eye pattern deteriorates, and take the midway point as the adjustment point. As a general guide, look for an overall clear waveform, and one of the diamond shapes in the eye pattern. The diamond shapes should appear in fine lines at the point of optimum adjustment. Take care not to knock the pick-up with the screwdriver at this stage. (This kind of accident can result in loss of focus.) (See Waveform.1,2)
3. Apply "screw-lock" to the tangential adjustment screw.
4. After adjusting tangential skew, also adjust the grating.



—REFOUT

NG

Waveform.1



—REFOUT

OK

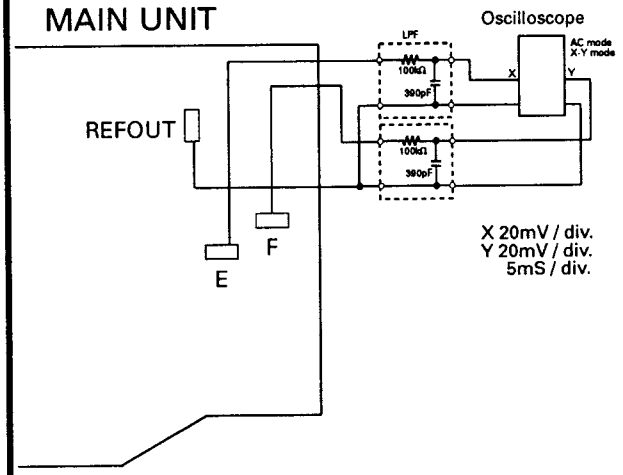
Waveform.2

0.5V/div.
0.5μs/div.
DC mode

3 Grating Adjustment-1(Fine adjustment)

- **Purpose:**
  The grating may need adjustment in a replaced pick-up unit.
- **Maladjustment symptoms:**
  No disc playback, track jumping.

- **Measuring equipment / jigs:**
  Oscilloscope, clock driver, two low-pass filters
- **Measuring point:**
  E LPF output, F LPF output
- **Test disc and setting:**
  SONY TYPE 4 (or ABEX TCD-782) Test mode
- **Adjustment position:**
  Pick-up grating adjustment hole



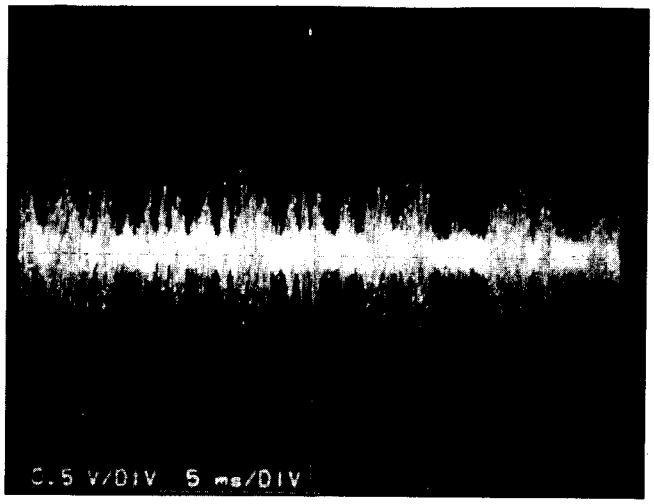
Adjustment Procedure

1. Connect a low-pass filter as shown in the above diagram.
2. Switch regulator ON in test mode, and load a disc.
3. Using the ⏭ or ⏮ key,move the pick-up to about the center of the test disc.
4. Press the **F•2** key to close focus.
5. Using the driver, adjust the Lissajous figure to a single line (or as close as possible).
   (See Waveform.8)
6. Switch regulator OFF and remove the filters.

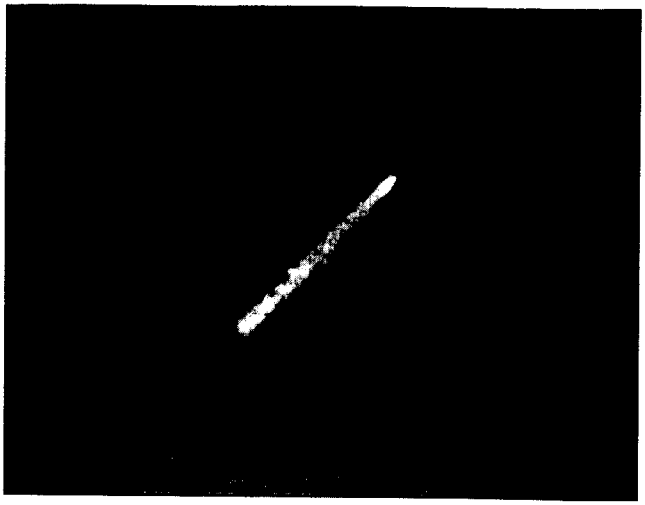
TEY waveform 5ms/div., 500mV/div.

Nul Point

Lissajous figure (AC input)
Horizontal axis E 20mV/div.
Vertial axis F 20mV/div.

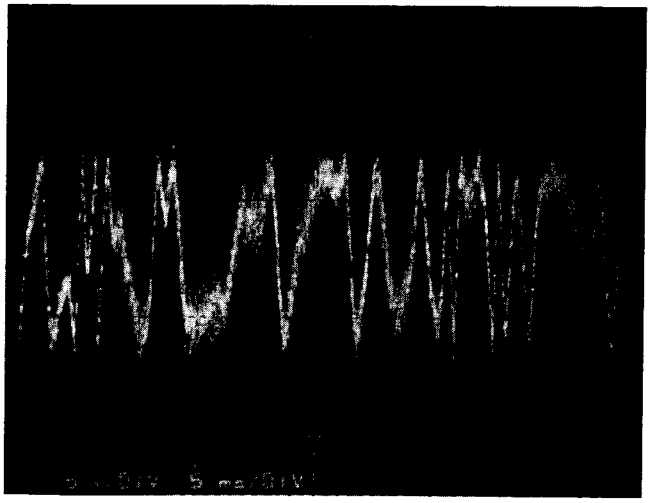


Waveform.3

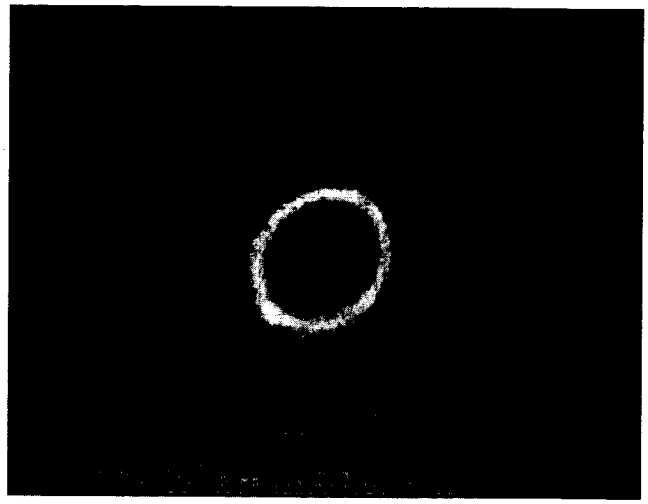


Waveform.4

"Rough" adjustment

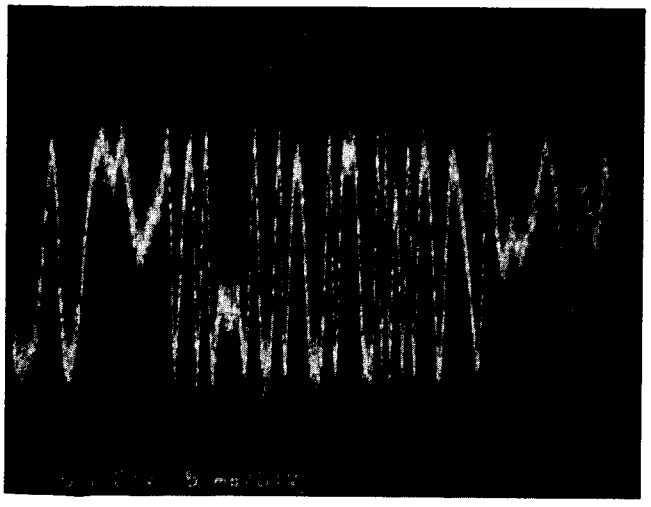


Waveform.5

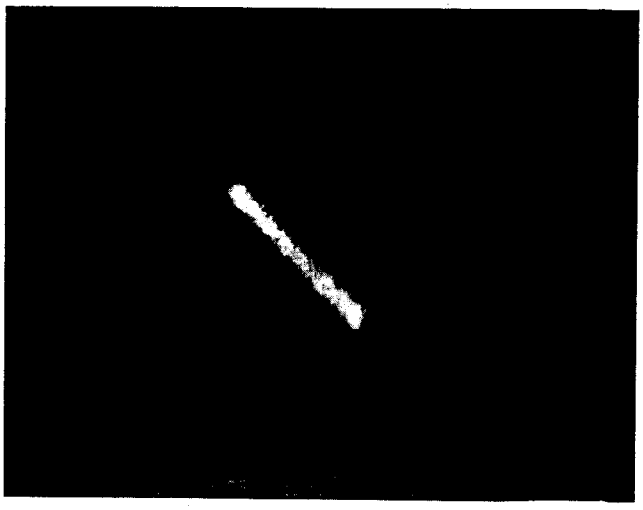


Waveform.6

Final adjustment



Waveform.7

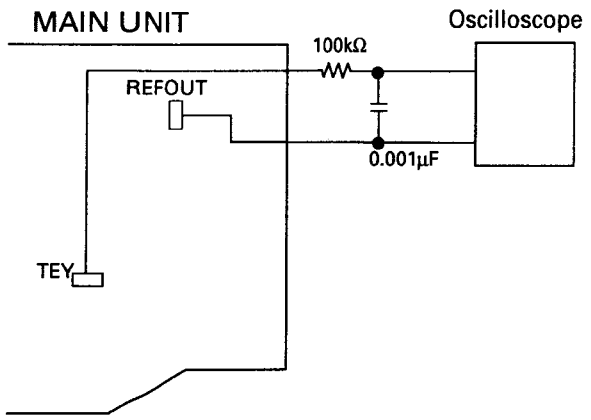


Waveform.8

4 Grating Adjustment-2

- Grating Adjustment-2 may be performed ih Grating Adjustment-1 (rough adjustment and fine adjustment).
- **Purpose:**
  The grating may need adjustment in a replaced pick-up unit.
- **Maladjustment symptoms:**
  No disc playback, track jumping.

- **Measuring equipment / jigs:**
  Oscilloscope, grating adjustment driver, low-pass filter
- **Measuring point:**
  TEY
- **Test disc and setting:**
  SONY TYPE 4 (or ABEX TCD-782) Test mode
- **Adjustment position:**
  Pick-up grating adjustment hole



Adjustment Procedure

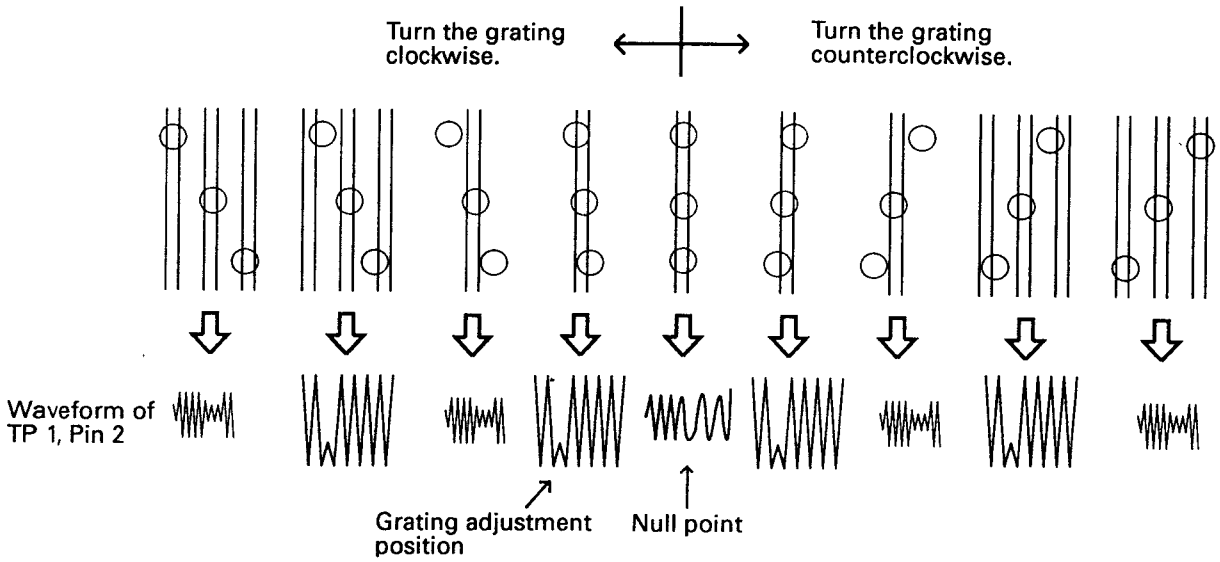
1. In the test mode, set a test disc-loaded magazine and select the tray with a test disc.
2. Switch regulator ON .
3. Using the ▶▶| or |◀◀ key, move the pick-up to center of the test disc.
4. Press the **F•2** key to close focus.
5. Insert the adjusting screwdriver in the slit for the pick-up grating adjustment and adjust the grating to seek out the null point. For details, see following page.
6. As the screwdriver is slowly turned clockwise from the null point, the amplitude of the waveform increases gradually. As the screwdriver continues to be turned, the amplitude of the waveform decreases again. Adjust the grating to a point at which the amplitude of the waveform first reaches the maximum while the screwdriver is turned clockwise from the null point.

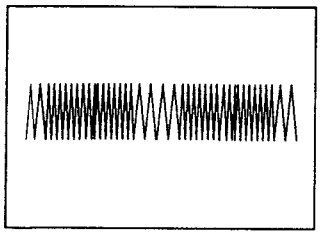
● **How to seek the null point**

When the screwdriver is inserted in the slit for grating adjustment while the angle of the grating is varied, the amplitude of the TEY tracking error signal varies.

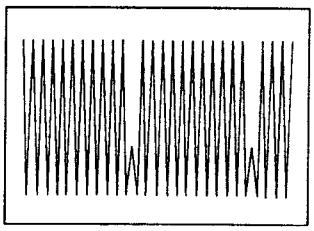
There are 5 or 6 positions where the amplitude of the waveform is decreased in the grating variable range. In only one of the waveform amplitude diminishing positions, the envelope is made smooth . This position denotes the state where three laser beams divided by the grating are aligned right on the same track.

This position is referred to as the null point. Adjust the grating to seek out the null point which is used as a reference position in performing the grating adjustment.

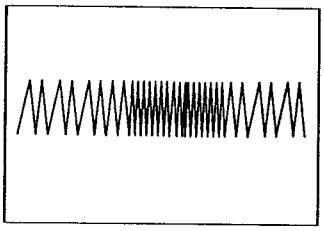




Waveform at null point



Waveform of maximum amplitude

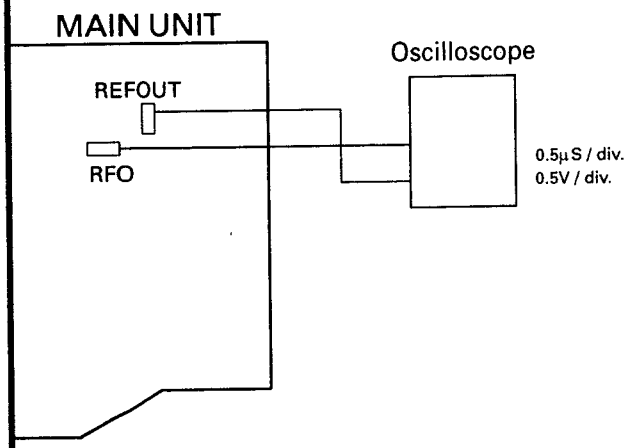


Waveform in positions other than null point

5 FE Bias Adjustment

- **Purpose:**
  To adjust the focus servo bias to an optimum value.
- **Maladjustment symptoms:**
  Focus closing difficulty, poor playability.

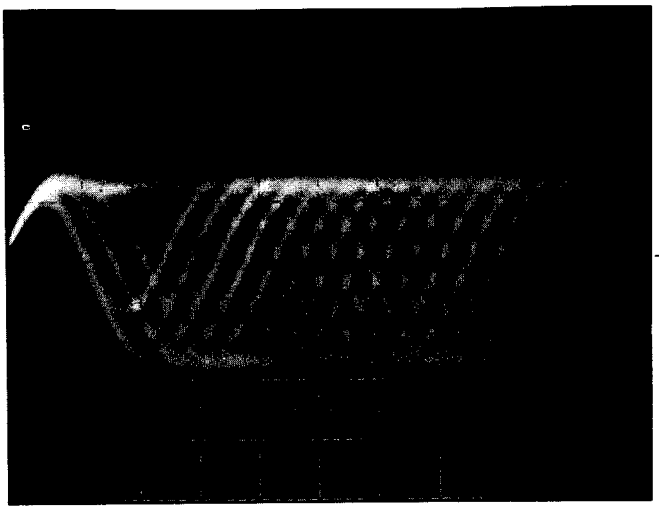
- **Measuring equipment / jigs:**
  Oscilloscope, volume adjustment driver
- **Measuring point:**
  RFO
- **Test disc and setting:**
  SONY TYPE 4 (or ABEX TCD-782) Normal mode
- **Adjustment position:**
  VR351 (FEB)



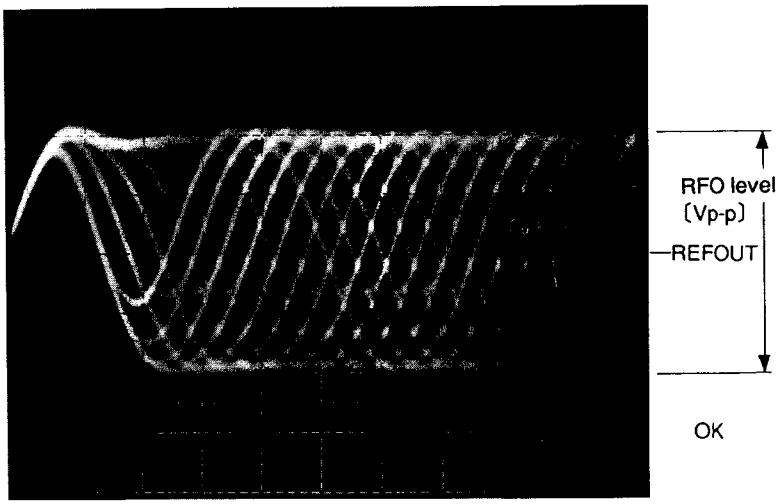
Adjustment Procedure

1. Play tune TNO 12 in normal mode.(ABEX TCD-782:TNO 19)
2. Observe RFO in respect to REFOUT in the oscilloscope, and adjust VR351 (FEB) to obtain maximum RF and optimum eye pattern.(See Waveform. 9,10)
3. After adjustment, measure the RFO output level shown in Waveform.10 and take actions shown below.

Output level	Action
2.8Vp-p more than	Replace the pick-up
1.2Vp-p - 2.6Vp-p	Normal
1.2Vp-p less than	Replace the pick-up

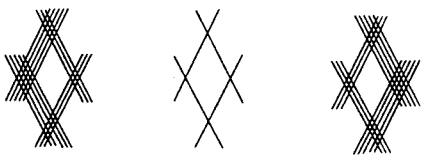


Waveform.9



Waveform.10

0.5V/div.
0.5μs/div.
DC mode

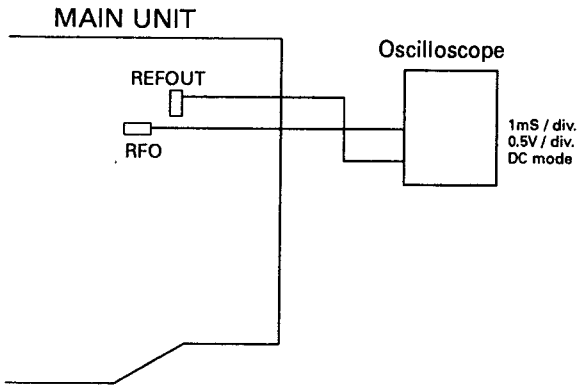


NG OK NG

6 RF Offset Adjustment

- **Purpose:**
  To adjust the RF amplifier offset to a suitable value.
- **Maladjustment symptoms:**
  Focus closure fails readily.

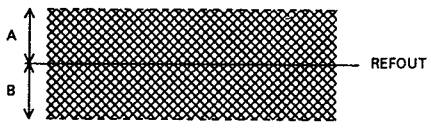
- **Measuring equipment / jigs:**
  Oscilloscope, volume adjustment driver
- **Measuring point:**
  RFO
- **Test disc and setting:**
  SONY TYPE 4 (or ABEX TCD-782) Normal mode
- **Adjustment position:**
  VR352 (RFO)



When using a multi-channel oscilloscope, do not connect the other negative probe to ground.

Adjustment Procedure

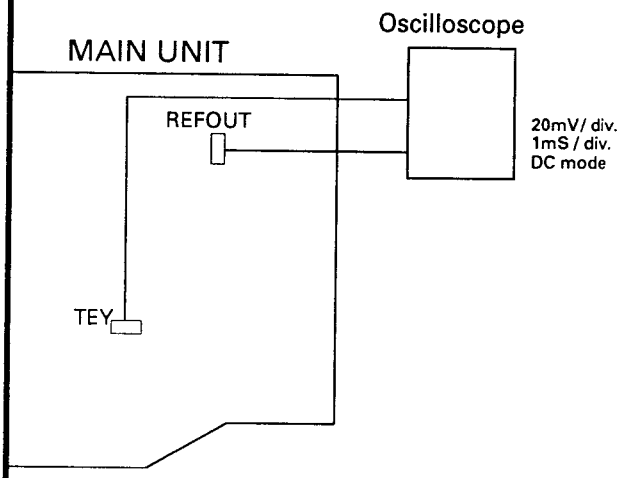
1. Play tune TNO 12 in normal mode.(ABEX TCD-782:TNO 19)
2. Using VR352 to adjust the RFO waveform so that REFOUT appears at the center.(A-B must not exceed 100 mV.)



7 TE Offset Adjustment-1

- **Purpose:**
  To adjust the electrical offset of the tracking servo to zero.
- **Maladjustment symptoms:**
  Search times too long, carriage run-away.

- **Measuring equipment / jigs:**
  DC voltmeter or oscilloscope, volume adjustment driver
- **Measuring point:**
  TEY
- **Test disc and setting:**
  Enpty magazine Test mode
- **Adjustment position:**
  VR353



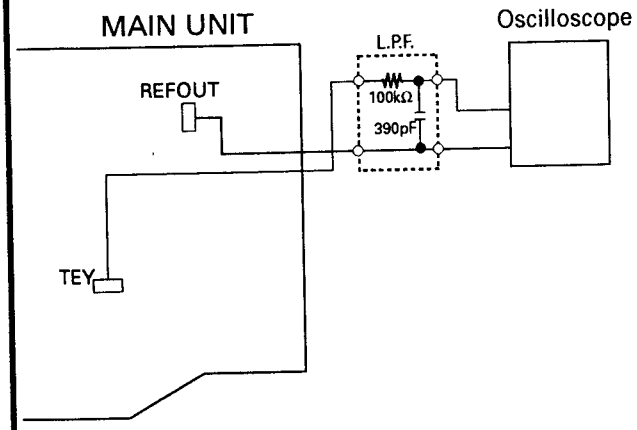
Adjustment Procedure

1. Select a tray without a disk, while in test mode.
2. Switch regulator ON.
3. Using VR353, adjust the TEY output DC voltage in reference to REFOUT to a value of 0±25mV.
4. Switch regulator OFF.

8 Tracking Balance Adjustment-1

- **Purpose:**
  To adjust the tracking servo offset to zero.
- **Maladjustment symptoms:**
  Search times too long, poor playability, carriage run-away.

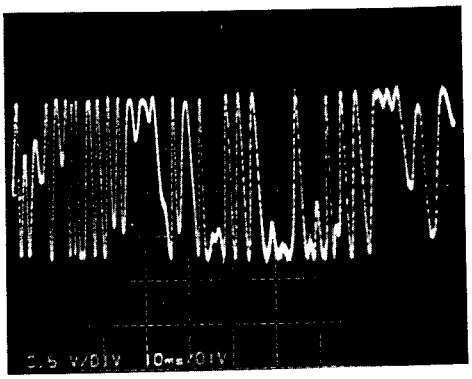
- **Measuring equipment / jigs:**
  Oscilloscope,volume adjustment driver
- **Measuring point:**
  TEY (Tracking error signal)
- **Test disc and setting:**
  SONY TYPE 4 (or ABEX TCD-782) Test mode
- **Adjustment position:**
  VR354 (T.BAL)

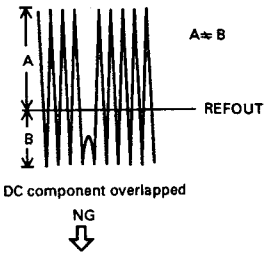


Adjustment Procedure

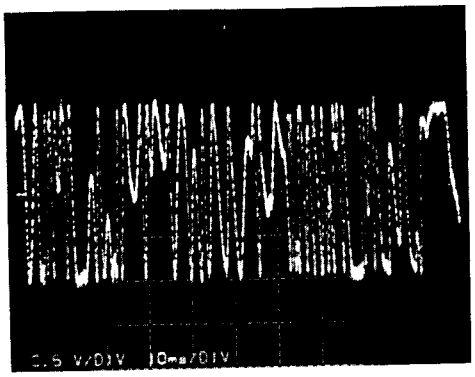
1. After checking that regulator is OFF, connect the low-pass filter as shown in the diagram.
2. Set the test disc. Switch regulator ON.
3. Using the ⏭ or ⏮ key, move the pick-up to about the center of the signal surface.
4. Press the **F•2** key to close focus.
5. Using an oscilloscope, observe the TEY signal in respect to REFOUT.
   Then adjust VR354 (T.BAL)to set the positive and negative amplitudes to the same levels.
   (See Waveform.11-13)
6. Switch the power OFF.

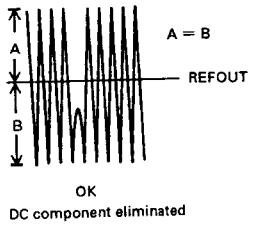
TEY waveform
0.5V/div.
10ms/div.



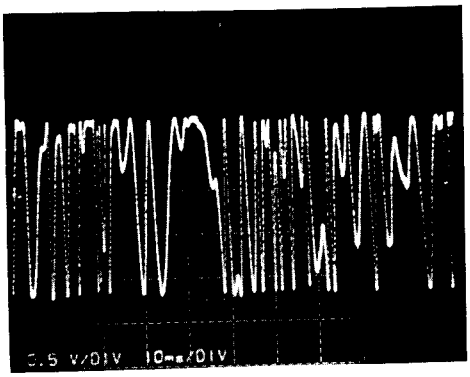


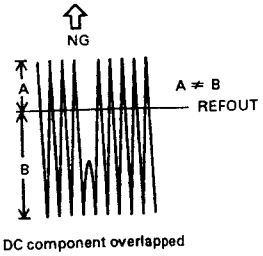
Waveform.11





Waveform.12



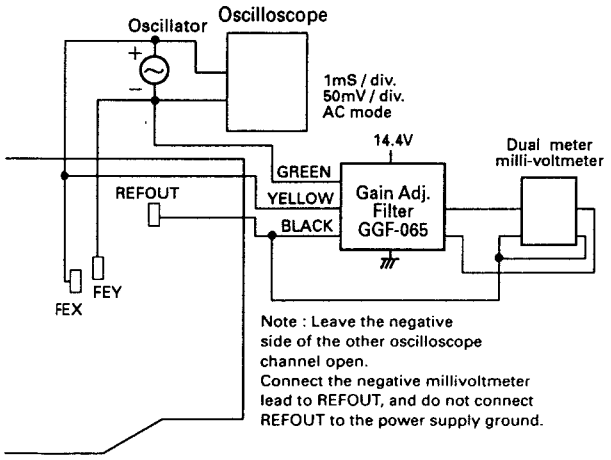


Waveform.13

9 Focus Servo Loop Gain Adjustment-1

- Focus Servo Loop Gain Adjustment-1 may be performed in Focus Servo Loop Gain Adjustment-2.
- **Purpose:**
  To adjust the focus servo loop gain to an optimum value.
- **Maladjustment symptoms:**
  Poor playability, reduced resistance to vibration, focus closure fails readily.

- **Measuring equipment / jigs:**
  Oscillator, gain adjustment filter (GGF-065), oscilloscope, dual meter milli-voltmeter, volume adjustment driver
- **Measuring point:**
  FEX, FEY
- **Test disc and setting:**
  SONY TYPE 4 (or ABEX TCD-782) Normal mode
- **Adjustment position:**
  VR355



MAIN UNIT

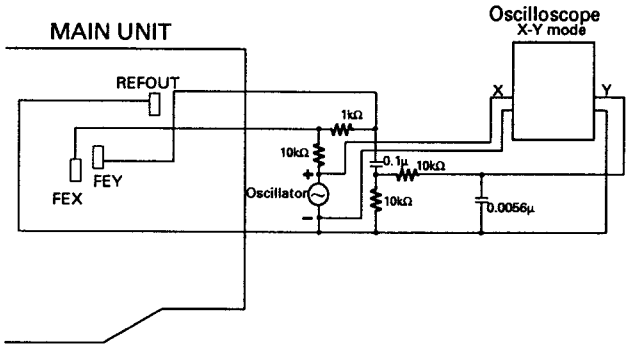
Adjustment Procedure

1. After checking that the power is OFF, connect the gain adjustment filter and measuring equipment as shown in the above diagram.
2. Play tune TNO 12 in normal mode.(ABEX TCD-782 :TNO 19)
3. Set the oscillator to 1kHz,and observe the FEX/FEY output in the oscilloscope. Adjust the oscillator output to obtain a FEX/FEY output of 100mVp-p.
4. Adjust VR355 to obtain a milli-voltmeter difference of 0±0.5dB.

10 Focus Servo Loop Gain Adjustment-2

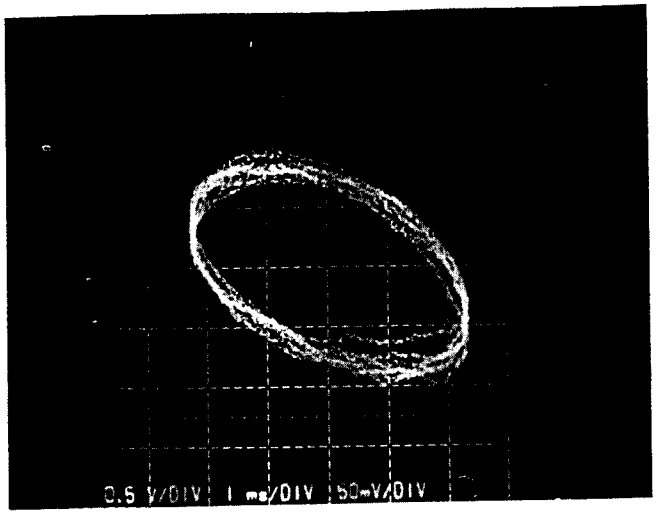
- **Purpose:**
  To adjust the focus servo loop gain to an optimum value.
- **Maladjustment symptoms:**
  Poor playabillity, reduced resistance to vibration, focus closure fails readily.

- **Measuring equipment / jigs:**
  Oscillator, gain adjustment filter, oscilloscope
- **Measuring point:**
  FEX, FEY
- **Test disc and setting**
  SONY TYPE 4 (or ABEX TCD-782) Normal mode
- **Adjustment position:**
  VR355



Adjustment Procedure

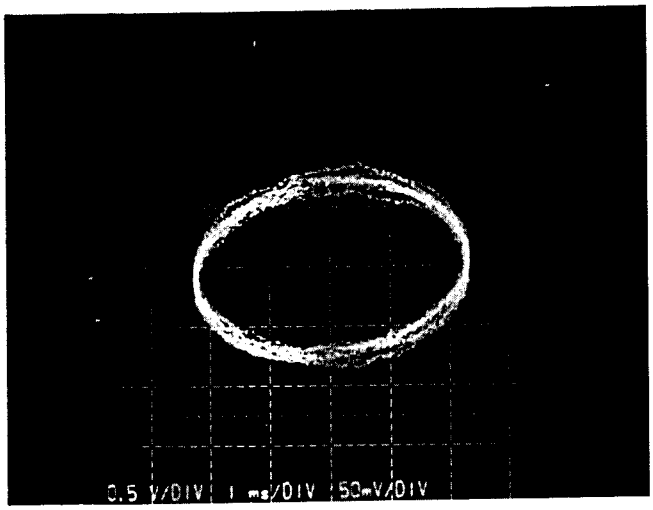
1. After checking that the power is OFF, connect the gain adjustment filter and measuring equipment as shown in the above diagram.
2. Play tuneTNO 12 in normal mode.(ABEX TCD-782:TNO 19)
3. Set the oscillator at 1kHz and adjust the output of the oscillator to 2Vp-p.
4. Adjust VR355 to make the Lissajou's figure of waveform symmetrical about X and Y axes respectively.



High-level gain

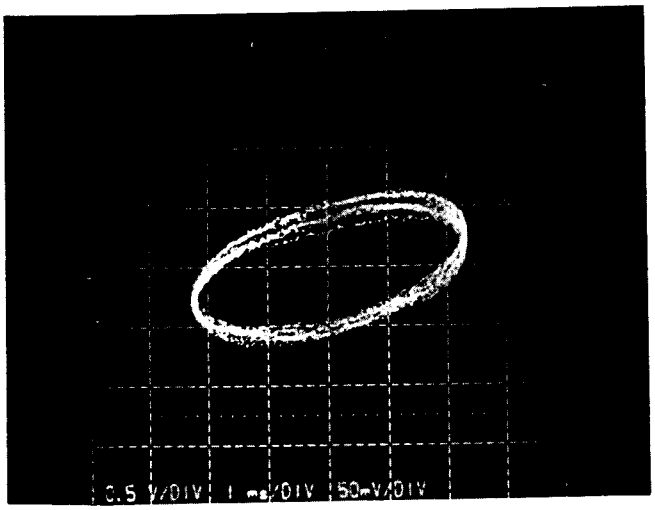
Focus
X=0.5V/div.
Y=50mV/div.
1ms/div.

Waveform.14



Optimum gain

Waveform.15



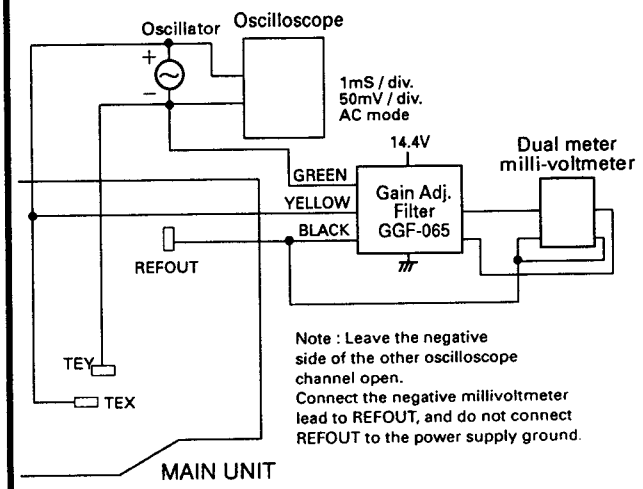
Low-level gain

Waveform.16

11 Tracking Servo Loop Gain Adjustment-1

- Tracking Servo Loop Gain Adjustment-1 may be performed in Tracking Servo Loop Gain Adjustment-2.
- **Purpose:**
  To adjust the tracking servo loop gain to an optimum value.
- **Maladjustment symptoms:**
  Poor playability, reduced resistance to vibration.

- **Measuring equipment / jigs:**
  Oscillator, gain adjustment filter(GGF-065), oscilloscope, dual meter milli-voltmeter, volume adjustment driver
- **Measuring point:**
  TEX, TEY
- **Test disc and setting:**
  SONY TYPE 4 (or ABEX TCD-782) Normal mode
- **Adjustment position:**
  VR356



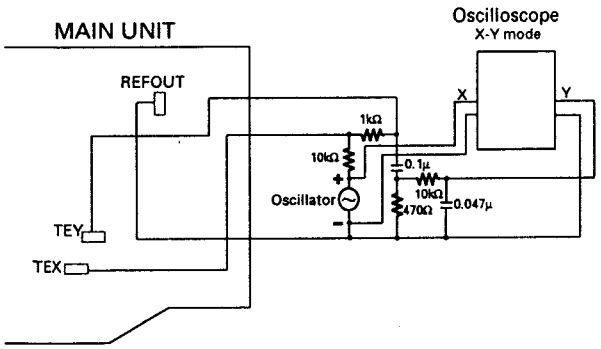
Adjustment Procedure

1. After checking that the power is OFF, connect the gain adjustment filter and measuring equipment as shown in the above diagram.
2. Play tune TNO 12 in normal mode.(ABEX TCD-782:TNO19)
3. Set the oscillator to 1.4kHz, and observe the TEX/TEY output in the oscilloscope. Adjust the oscillator output to obtain a TEX/TEY output of 300mVp-p.
4. Adjust VR356 to obtain a milli-voltmeter difference of 0±0.5dB.

12 Tracking Servo Loop Gain Adjustment-2

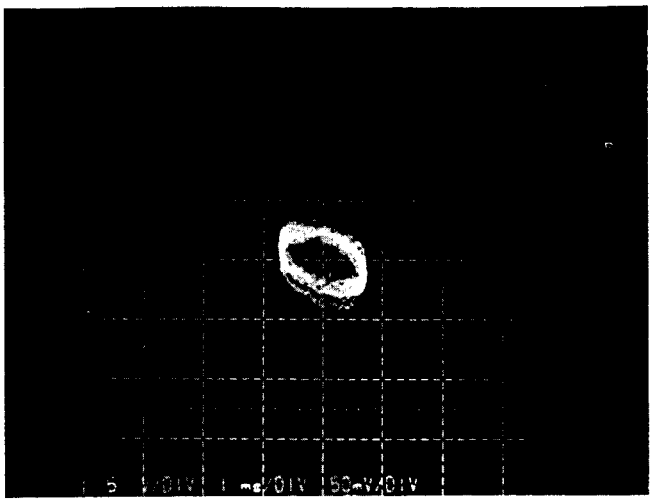
- **Purpose:**
  To adjust the tracking servo loop gain to an optimum value.
- **Maladjustment symptoms:**
  Poor playability, reduced resistance to vibration.

- **Measuring equipment / jigs:**
  Oscillator, gain adjustment filter, oscilloscope
- **Measuring point:**
  TEX, TEY
- **Test disc and setting:**
  SONY TYPE 4 (or ABEX TCD-782) Normal mode
- **Adjustment position:**
  VR356



Adjustment Procedure

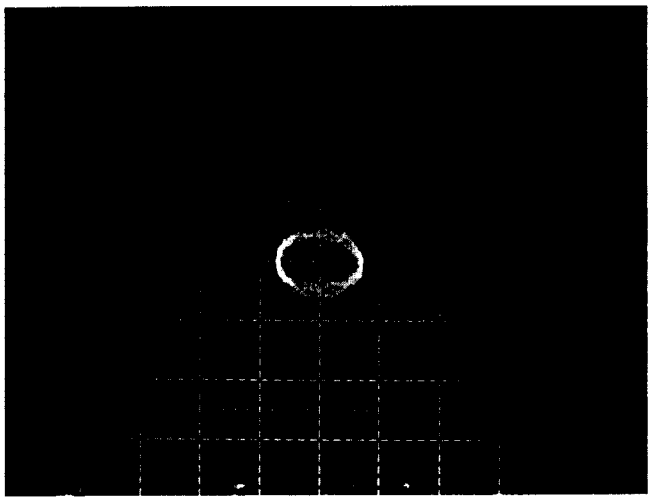
1. After checking that the power is OFF, connect the gain adjustment filter and measuring equipment as shown in the above diagram.
2. Play tune TNO 12 in normal mode.(ABEX TCD-782:TNO19)
3. Set the oscillator at 1.4kHz and adjust the output of the oscillator to 5Vp-p.
4. Adjust VR356 to make the Lissajou's figure of waveform symmetrical about X and Y axes respectively.



High-level gain

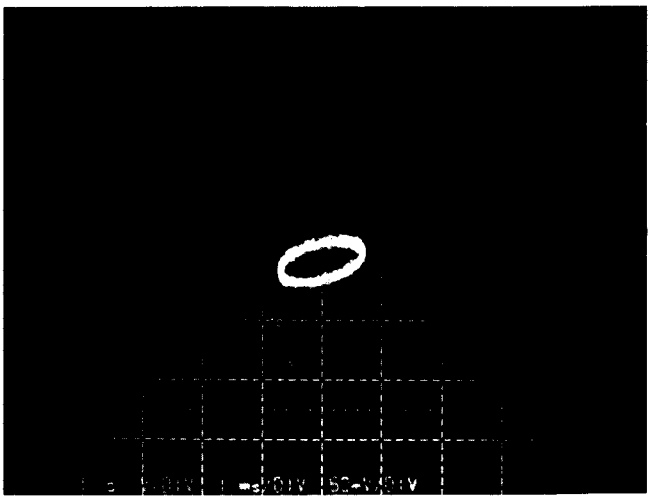
Tracking
X=5V/div.
Y=50mV/div
2ms/div.

Waveform.17



Optimum gain

Waveform.18



Low-level gain

Waveform.19

13 TE Offset Adjustment-2

- **Purpose:**
  To adjust the electrical offset of the tracking servo to zero.
- **Maladjustment symptoms:**
  Search times too long, carriage run-away.

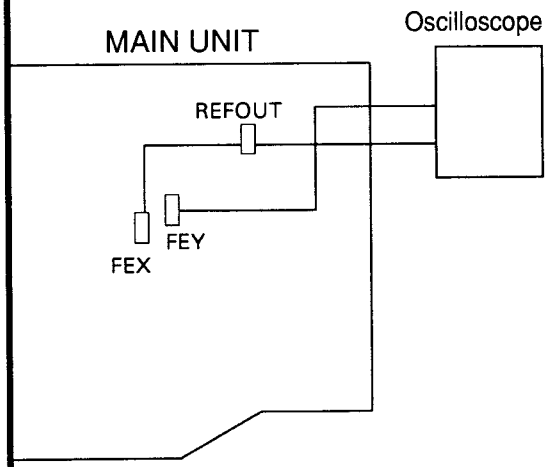
- **Measuring equipment / jigs:**
  DC voltmeter or oscilloscope,
  volume adjustment driver
- **Measuring point:**
  TEY
- **Test disc and setting:**
  No Disc Test mode
- **Adjustment position:**
  VR353

Adjustment Procedure
Same as for TE offset adjustment-1, but with the DC voltage of the TEY output adjusted to 0±50mV.
The purpose of this additional adjustment is to correct any deviations generated when carrying out the tracking balance and tracking servo loop gain adjustments after completing TE offset adjustment-1.

14 Checking FEY Level

- **Purpose:**
  Check the focus error level.
- **If the level is insufficient:**
  Focus is hard to close and the playability is worsened.

- **Measuring equipment / jigs:**
  Oscilloscope
- **Measuring point:**
  FEY
- **Test disc and setting:**
  SONY TYPE 4 (or ABEX TCD-782) Test mode

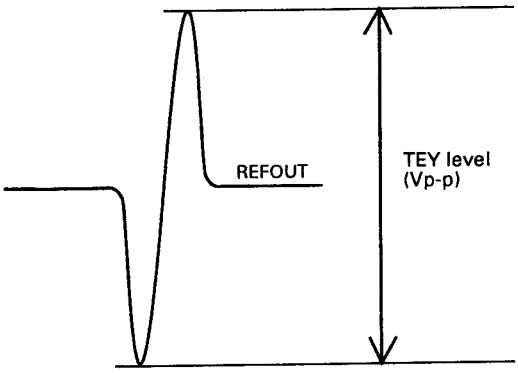


Checkout Procedure(This checkout always must be performed after gain adjustment.)

1. Connect the oscilloscope to REFOUT and FEY. Connect FEX to REFOUT.
2. In the test mode, set a test disc-loaded magazine and select a tray with a test disc.
3. Switch regulator ON.
4. Using the ⏭ or ⏮ key, move the pick-up to the center of the test disc.
5. Press the **F•2** key to close focus. During this action, the disc repeats acceleration and deceleration.
6. Observe the FEY waveform and measure the FEY level.
7. Switch regulator OFF.
8. Disconnect FEX and REFOUT.

Normal level of FEY:2.0Vp-p more than
If the level is less than the above, examine the peripheral circuits of the unit or replace the pick-up.

Waveform.20



In addition to the waveform shown above, the FEY level output produces another waveform like ⌐∿¬ . However, take measurement only of the above figure of waveform.

15 Tracking Balance Adjustment-2 and Checking TEY Level

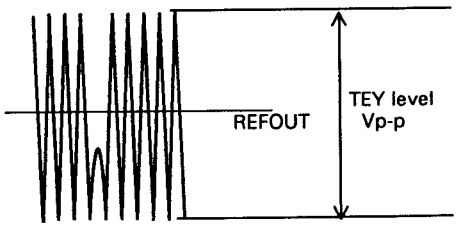
- **Purpose:**
  To adjust the tracking servo offset to zero.
- **Maladjustment symptoms:**
  Search times too long, poor playability, carriage run-away.

- **Measuring equipment / jigs:**
  Oscilloscope,
  volume adjustment driver
- **Measuring point:**
  TEY (Tracking error signal) L.P.F. output
- **Test disc and setting:**
  SONY TYPE 4 (or ABEX TCD-782) Test mode
- **Adjustment position:**
  VR354

Adjustment Procedure

Steps 1 through 5 are the same as the steps taken in the tracking balance adjustment-1.

6. Check to see that the level of positive and negative amplitudes of TEY signal. If there is deviation, make adjustment using VR354.
7. After adjustment measure the TEY level. (Measurement always should be made afrer the tracking gain adjustment is completed. Before the adjustment, normal level measurement cannot be achieved.)



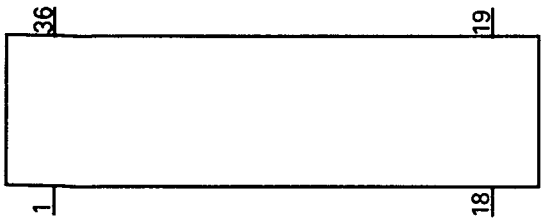
Normal range of TEY level:2.0±0.5Vp-p

If the level is out of the above range, examine the peripheral circuits of the unit or replace the pick-up.

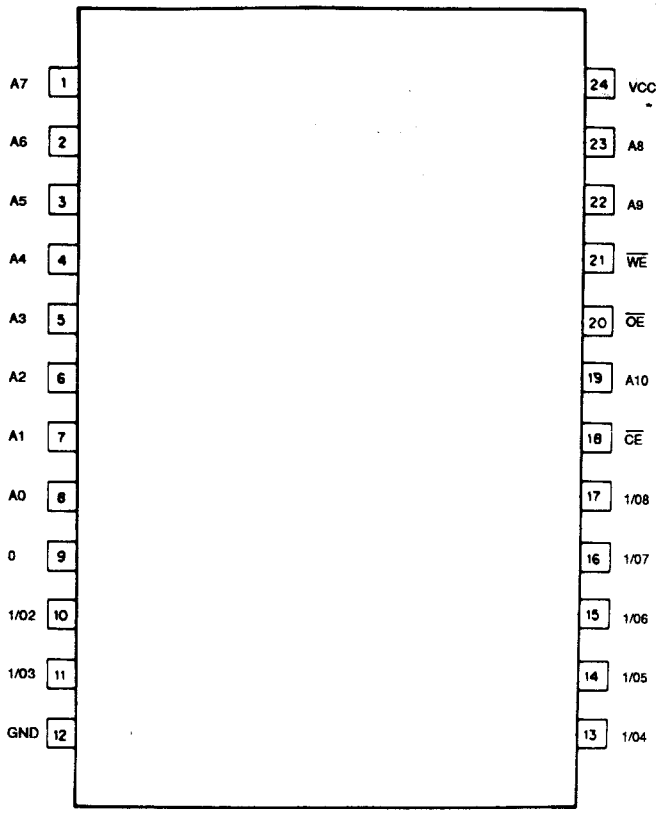
●ICs
●Pin Functions (UPC1347GS)

Pin No.	Pin Name	I/O	Function and Operation
1	VCC		
2	BP-	I	Vibration detect amplifier 1 inverter input
3	BPO	O	Vibration detect amplifier 1 output
4	WC+	I	Window comparator non-inverting input
5	WC-	I	Window comparator inverting input
6	GND		GND
7	QDH	I	Vibration detect amplifier 3 non-inverting input
8	QDO	O	Vibration detect amplifier 3 output
9	A	I	A signal input
10	C	I	C signal input
11	B	I	B signal input
12	D	I	D signal input
13	E	I	E signal input
14	F	I	F signal input
15	PIN	I	APC circuit PD amplifier input
16	LA	O	APC circuit LD amplifier output
17	LAON		Laser diode ON/OFF switching
18	VREF1		Reference voltage
19	GND2		GND
20	RF+	I	RF amplifier non-inverting input
21	RFS	O	RF summing virtual output
22	RF-	I	RF amplifier inverting input
23	NC		Not used
24	RFO	O	RF amplifier output
25	APC-	I	APC circuit PD amplifier inverting
26	TE2+	I	Tracking error amplifier 2 non-inverting input
27	APCO	O	APC circuit PD amplifier output
28	TE1O	O	Tracking error amplifier 1 output
29	TE2-	I	Tracking error amplifier 2 inverting input
30	TE2O	O	Tracking error amplifier 2 output
31	VREF2		Reference voltage
32	FE2+	I	Focus error amplifier 2 non-inverting input
33	FE1+	I	Focus error amplifier 1 non-inverting input
34	FE1O	O	Focus error amplifier 1 output
35	FE2-	I	Focus error amplifier 2 inverter input
36	FE2O	O	Focus error amplifier 2 output

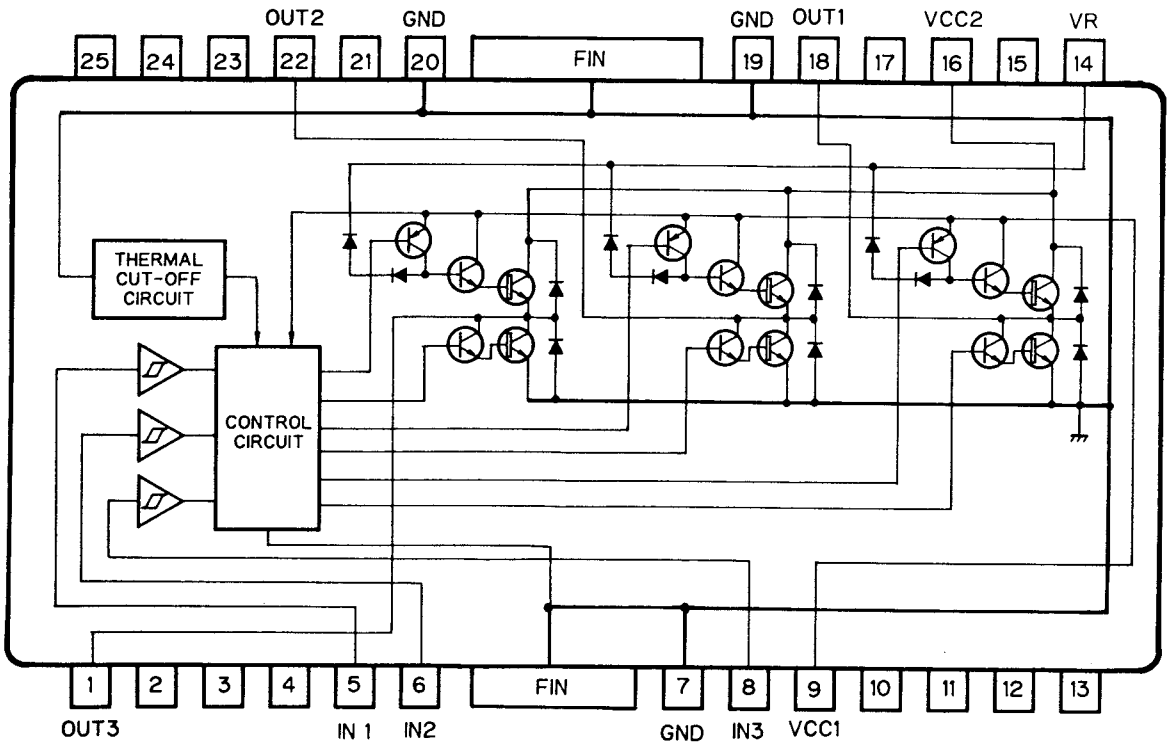
IC351:UPC1347GS



IC752:LH5116HN-10T



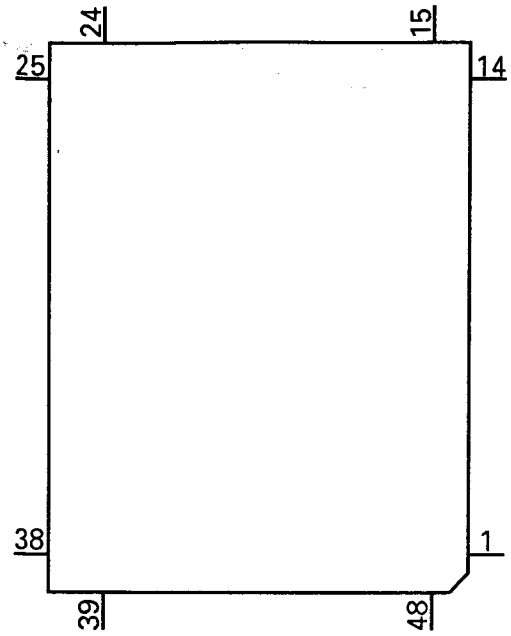
IC801:XRA6247FP



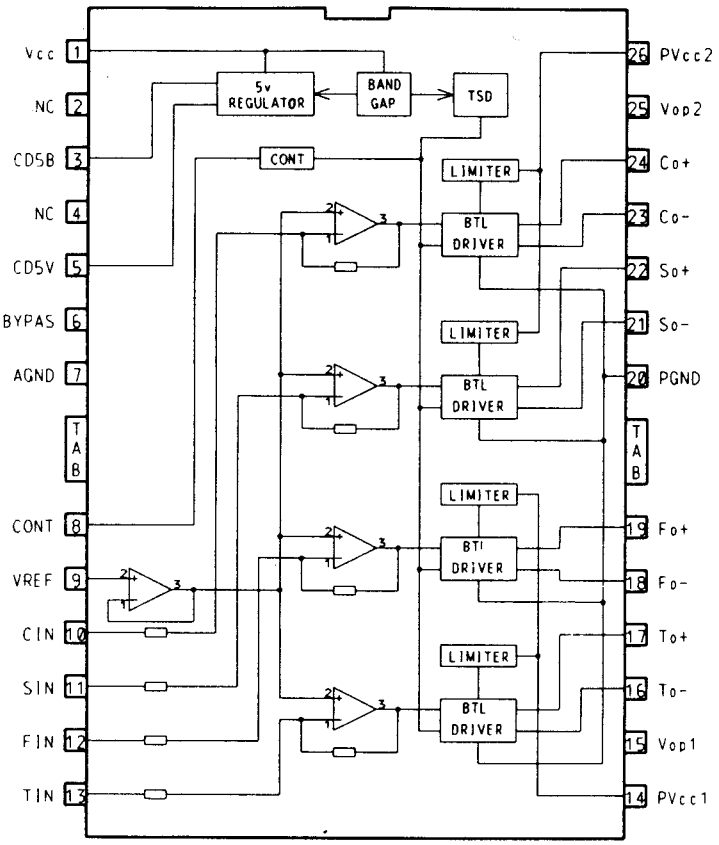
●Pin Functions (UPD6374AGH)

Pin No.	Pin Name	I/O	Function and Operation
1	VDD		Power supply
2	OUTSEL	I	Sets PWM output mode for the motor system
3	$\overline{SCK}$	I	Clock input terminal for serial data input and output
4	SI	I	Serial data input
5	SO	O	Serial data and status signal output
6	$\overline{STB}$	I	Signal latching serial data inside LSI
7	A0	I	Used in combination with stb
8	$\overline{RST}$	I	System reset
9	DGND		Logic circuit GND terminal
10	LOCK	I	Input terminal for detection of spindle servo error signal
11	MDR	I	Input terminal for detection of spindle servo error signal
12	MDF	I	Input terminal for detection of spindle servo error signal
13	WFCK	I	Input terminal for detection of spindle servo error signal
14	RFCK	I	Input terminal for detection of spindle servo error signal
15	AVDD		Positive power supply terminal for analog circuit
16	EFM	O	EFM signal output terminal
17	ASI	I	Level comparing input for RF signal comparison
18	RFI	I	Analog input terminal for EFM comparator
19	REFOUT	O	A/D converter midpoint output terminal inside LSI
20	AGND		Analog circuit GND
21	RF	O	RF signal input terminal
22	FE	I	Focus error terminal
23	TE	I	Tracking error input terminal
24	VR	I	Input signal is quantified as follows:FS=88.2kHz,Resolution:6 bits The output takes place directly at microcomputer interface, that is, not via the filter block within LSI.
25	AVDD		Positive power supply terminal for analog circuit
26	TECO	I	Tracking comparator input terminal
27	TECI	I	Tracking comparator input terminal
28	DVDD		Positive power supply terminal for logic circuit
29	FF	O	PWM positive output terminal for the focus loop filter
30	FR	O	PWM negative output terminal for the focus loop filter
31	TF	O	PWM positive output terminal for the tracking loop filter
32	TR	O	PWM negative output terminal for the tracking loop filter
33	DGND		Logic circuit GND terminal
34	SF	O	PWM positive output terminal for the thread loop filter
35	SR	O	PWM negative output terminal for the thread loop filter
36	MF	O	PWM positive output terminal for the spindle loop filter
37	MR	O	PWM negative output terminal for the spindle loop filter
38	DVDD		Positive power supply terminal for logic circuit
39	T7	I	Sets tracking PWM output mode
40	T6	I	Sets focus PWM output mode
41	T5	I	Selects motor modulation mode
42	T4	I	Selects between focus and tracking modulation mode
43	MIRR	O	MIRR detection signal output terminal
44	RFOK	O	RFOK detection signal terminal
45	HOLD	I	Hold control signal input terminal
46	TBC		Tracking bank switching terminal
47	CKIN	I	System clock input terminal
48	$\overline{TEST}$	I	Test terminal

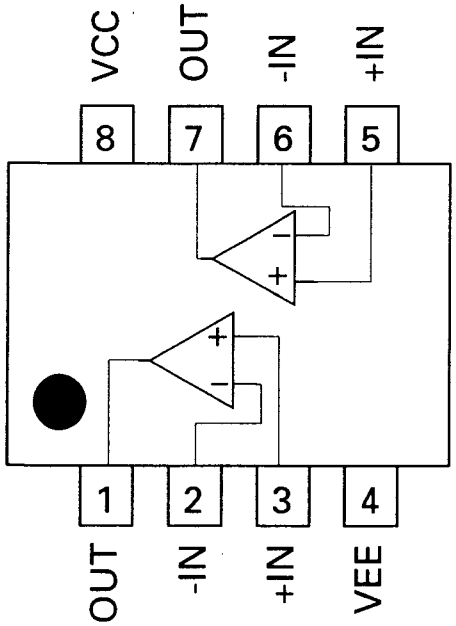
IC601:UPD6374AGH



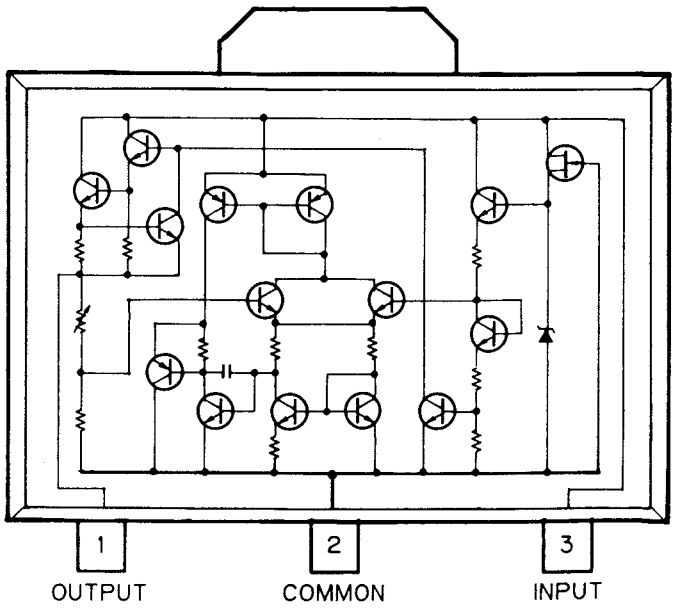
IC651:PA3026



IC602,652:NJM4558MD



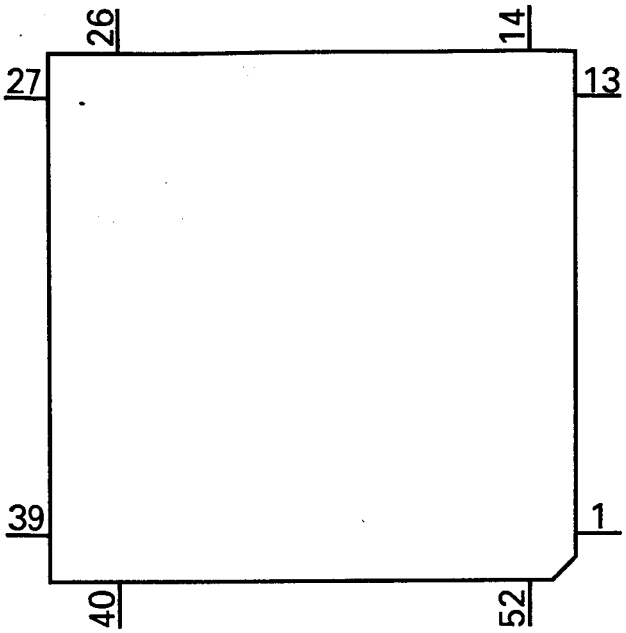
IC661:TA78L05F



●Pin Functions (UPD6375GC)

Pin No.	Pin Name	I/O	Function and Operation
1	NC		Not used
2	WDCK	O	Output terminal for signal having double the frequency of LRCK
3	C4LR	O	Output terminal for signal having four the frequency of LRCK
4	RFCK	O	Oscillation clock divider signal,output pin for signal giving 1-frame sync.
5	EFMI	I	EFM signal input terminal
6	TEST		Test terminal
7	VSS		Gnd
8	C1D1	O	Output terminal indicating C1 error correction status
9	C1D2	O	Output terminal indicating C1 error correction status
10	C2D1	O	Output terminal indicating C2 error correction status
11	C2D2	O	Output terminal indicating C2 error correction status
12,13	NC		Not used
14	STBY	I	Standby input terminal
15	NC		Not used
16	PLK1	O	VCO output terminal for use in analog PLL selection
17	VDD		5V
18	PLK8	I	VCO output terminal for use in analog PLL selection
19	PLCK	O	Bit clock monitor terminal
20	VSS		Gnd
21	POUT	O	Output terminal for phase comparison between EFM signal and bit clock
22	WFCK	O	Signal issuring one-frame period by bit clock dividing signal
23	VDD		5V
24	MDS	O	Signal indicating spindle motor CLV servo control output status
25	MDF	O	Spindle motor CLV servo control positive direction output terminal
26	MDR	O	Spindle motor CLV servo control negative direction output terminal
27	LOCK	O	"H" when synchronisation signal & frame counter output coincide at EFM demodulator.
28	$\overline{RST}$	I	Reset signal input terminal
29	A0	O	Control signal distinguishing data from microcomputer
30	$\overline{STB}$	I	Signal latching serial data inside LSI
31	SO		Serial data input terminal
32	SI	I	Input terminal for data from microcomputer
33	VSS		Gnd
34	$\overline{SCK}$	I	Clock input terminal serial data input
35	TX	O	Digital audio interface data output terminal
36	MUT/EMP	O	Output for mute command decoding signal or sub-Q command pre-emphasis data
37	SFSY	O	Signal indicating subcode one-frame synchronisation
38	SBSY	O	Signal indicating head of subcode block
39	SBCK	I	Subcode data read clock input terminal
40	SBSO	O	Subcode data output terminal
41	VDD		5V
42	$\overline{XTAL}$	O	Oscillation continuation terminal
43	XTAL	I	Oscillation continuation terminal
44	VSS		Gnd
45	C16M	O	Oscillation clock output terminal
46	VDD		5V
47	C4M	O	1/4 cycle output terminal for oscillation clock signals
48	FLAG	O	Flag sig. indicating that the current audio data output of incorrectable data
49	SCKO	O	Clock output terminal for audio serial data
50	DOUT	O	Serial audio data output terminal
51	LRCK	O	Signal distinguishing between left and right channel DOUT terminal output
52	NC		Not used

IC701:UPD6375GC



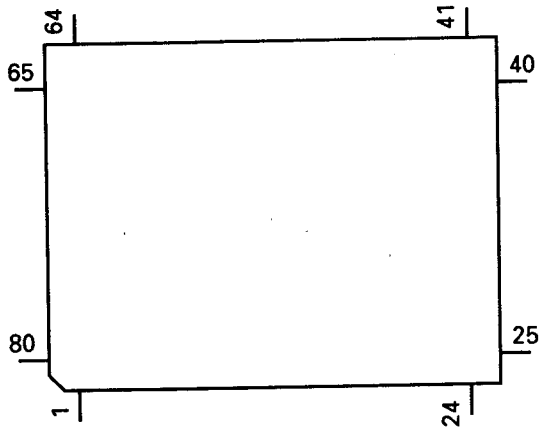
●Pin Functions (PD5230A)

Pin No.	Pin Name	I/O	Output Format	Function and Operation
1	TIN	I	C	Tray position input
2	TEMP			Temperature detector
3	VDIN			Power supply short sensor input
4	C/D	O	NM	Command/data appointment output
5	DCS	O	NM	Chip select output
6	DRDY	I	C	Ready input
7	DRST	O	NM	Reset
8	A0	O	NM	LSI data control signal
9	XSCK	I/O	NM	LSI clock input/output
10	XSO	O	NM	LSI data output
11	XSI	I	C	LSI data input
12	STB	O	C	LSI Strobe output
13	RST	O	C	LSI reset output
14–16	NC			Not used
17	BSENS	I		Back up power sense input
18	BRST	I		P-BUS reset input
19	BSRQ	O	C	P-BUS service request output pin
21	BSCK	I/O	C	P-BUS serial clock input/output
22	BSO	O	C	P-BUS serial data output
23	BSI	I		P-BUS serial data input
24	EJSW	I		Eject signal input
25	MAG	I		Magazine lock switch
26	CNVSS	I		GND
27	RESET	I		Reset input
28	EJLED	O	C	LED output for Eject
29	DCLOSE	I	C	Door close SW input
30	XIN	I		Crystal oscillating element connection pin
31	XOUT	O	C	Crystal oscillating element connection pin
32	VSS			GND
32–40	D7-D0	I/O	C	External RAM data line
41	POWER	O	C	CD +5V control
42	CONT	O	C	Servo driver power supply control
43	WE	O	C	External RAM write enable
44	PROT	O	C	External RAM output enable
45	CS	O	C	External RAM chip select
46–56	A10-A0	O	C	External RAM address line
57	EJP	I	C	Eject position switch
58	6/12	I	C	6/12 switching input
59	FECNT	I/O	C	DEFECT port
60	MIRR	I	C	Mirror detector input
61	LOCK	I	C	Spindle lock detector input
62	FOK	I	C	FOK signal input
63	HOME	I	C	Home position detector input
64	OPTSW	I	C	Digital output ON/OFF input
65	LOAD	O	C	Mechanism power supply control
66	I3	O	C	Motor driver control output
67	I1	O	C	Motor driver control output
68	I2	O	C	Motor driver control output
69	ENDOUT	O	C	Digital output enable signal
70	CDMUTE	O	C	CD mute output
71	ADENA	O	C	A/D reference voltage output
72	TESTIN	I	C	Test program mode input
73	VCC			
74	VREF	I		A/D reference voltage input
75	AVSS			A/D GND

Pin No.	Pin Name	I/O	Output Format	Function and Operation
76	CSEL	I		Compression select
77	NC			Not used
78	DISK			Disc detector input
79	TSEL	I	C	Tray position detector photo sensor
80	$\overline{\text{TOUT}}$	I	C	Disc sensor timing input

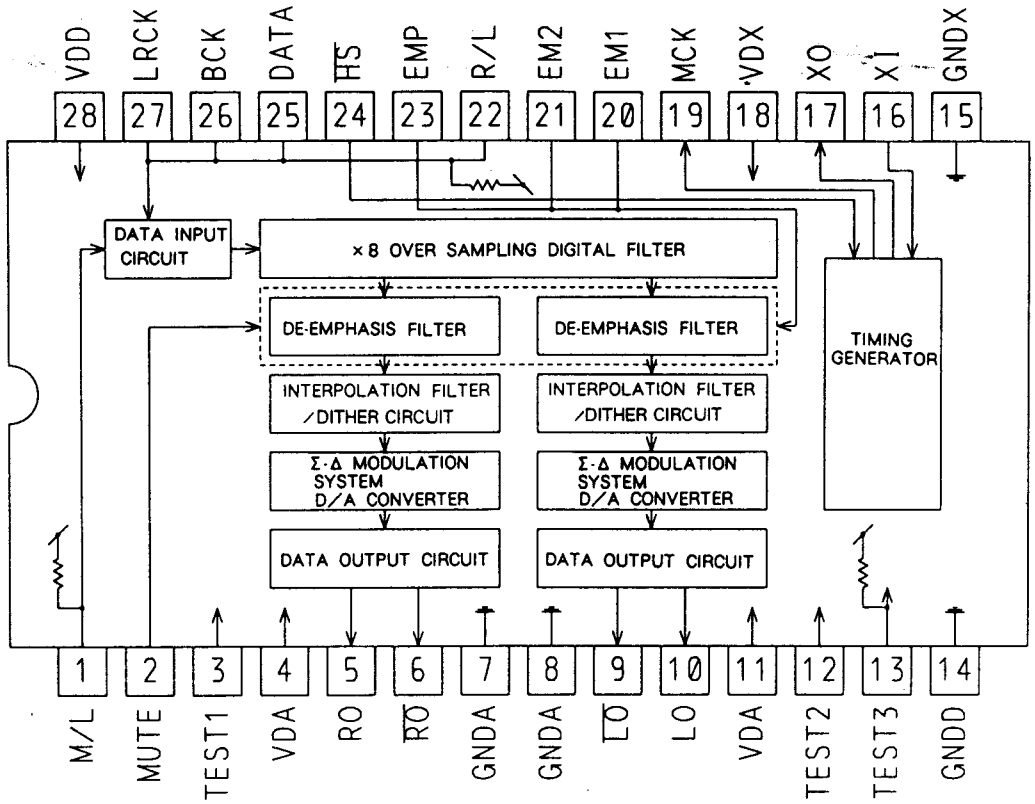
Output Format	Meaning
C	CMOS output
NM	Middle resistivity N channel open drain

*IC751:PD5230A

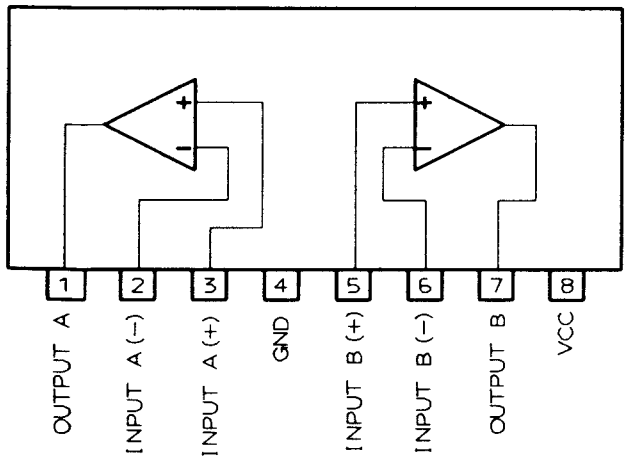


IC's marked by* are MOS type.
Be careful in handing them because they are very liable to be damaged by electrostatic induction.

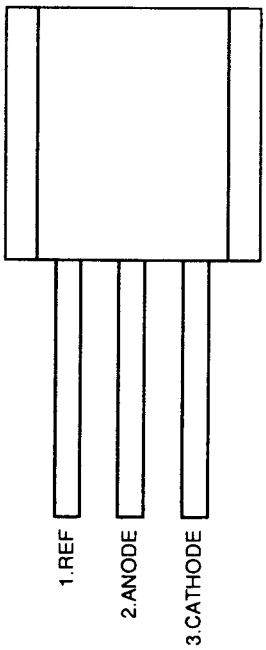
IC851:TC9237BN



IC853,854:M5218AL



IC981:NJM431L



t diagram.

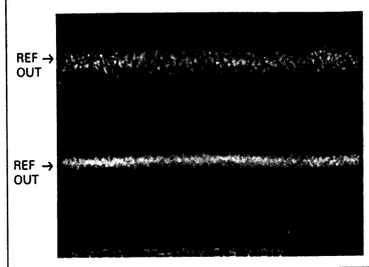
0.5ms/div.
part passes

2ms/div.
- UP)

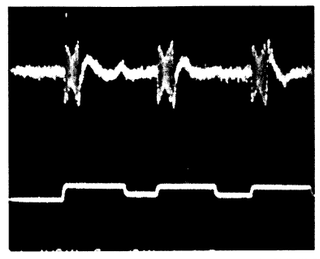
5ms/div.
:h
mp)

s/div.
:h

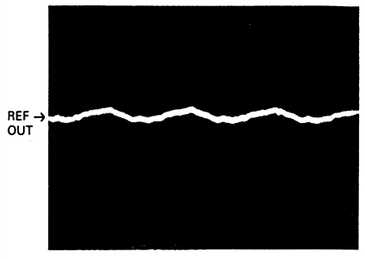
⑧ CH1: TEY 0.5V/div.
⑨ CH2: TIN 0.5V/div. 20ms/div.
Normal mode: Play



⑧ CH1: TEY
㉓ CH2: CIN 1V/div. 5ms/div.
Normal mode: Search



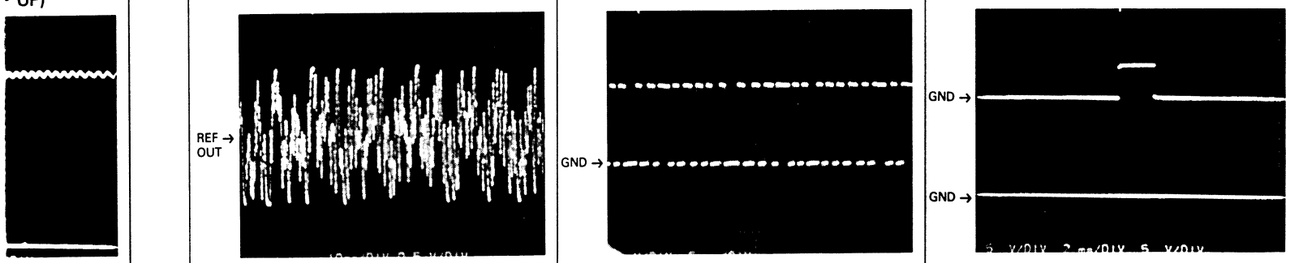
⑩ SIN 0.5V/div. 50ms/div.
Normal mode: Play (12cm disc)



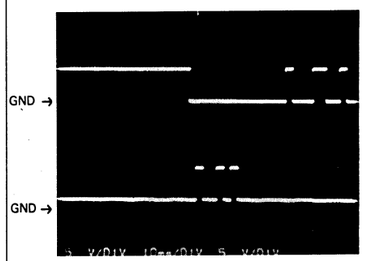
⑩ SIN 0.5V/div. 10ms/div.
Search (12cm disc)

⑪ EFM 2V/div. 5µs/div.
Play

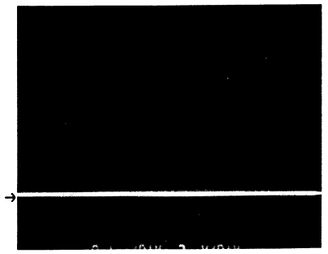
⑫ CH1: MDF 5V/div.
⑬ CH2: MDR 5V/div. 2ms/div.
Play



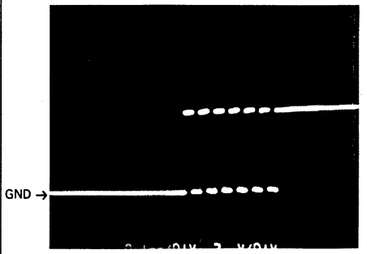
⑫ CH1: MDF 5V/div.
⑬ CH2: MDR 5V/div. 10ms/div.
Search



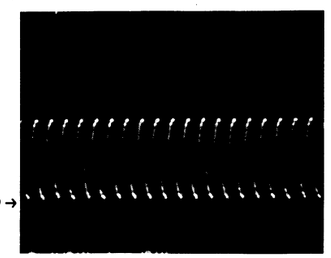
⑭ FLAG 2V/div. 0.1ms/div.
Play



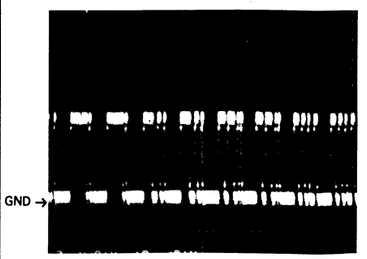
⑭ FLAG 2V/div. 0.1ms/div.
Search



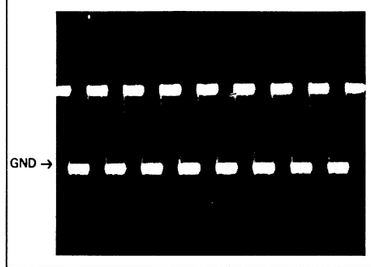
⑯ BCLK1 2V/div. 1µs/div.
Play



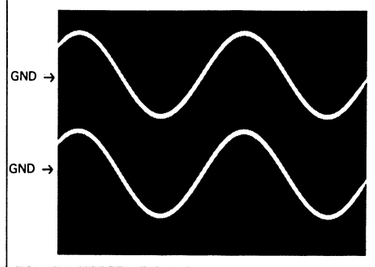
⑰ Dout 2V/div. 10µs/div.
Play



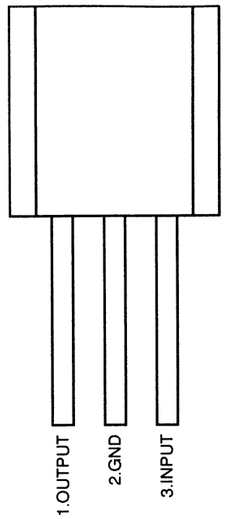
⑱ LRCK 2V/div 20µs/div.
Play



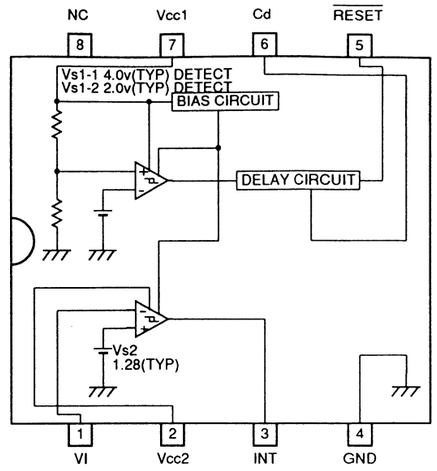
㉑ CH1: L CH 1V/div.
㉒ CH2: RCH 1V/div. 0.2ms/div.
Play (1kHz)



IC982:NJM78L05A

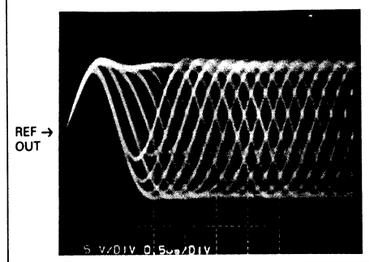
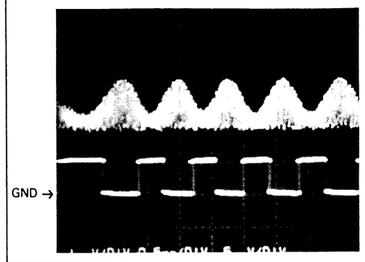
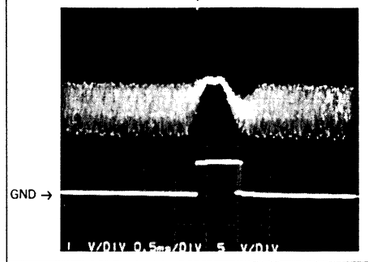
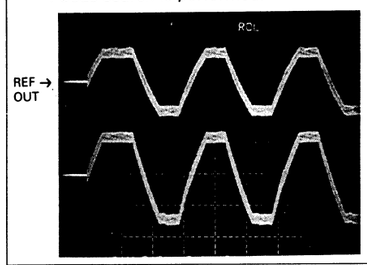
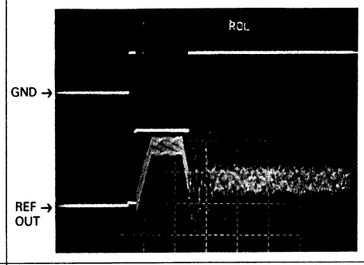
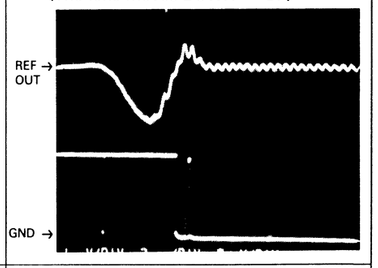
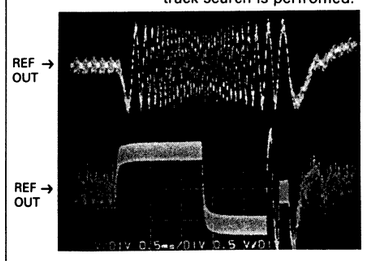
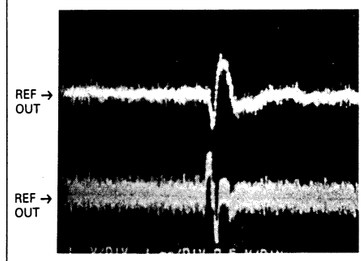
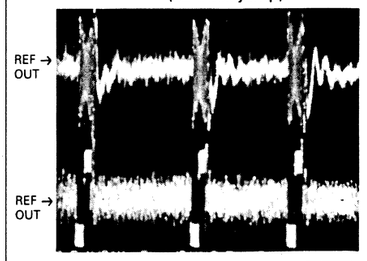
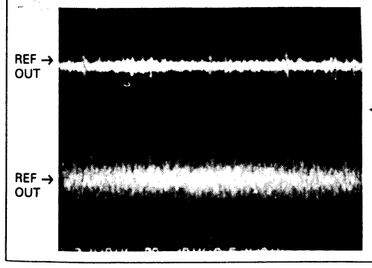
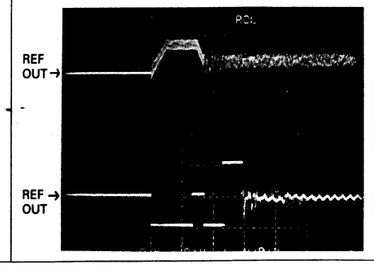
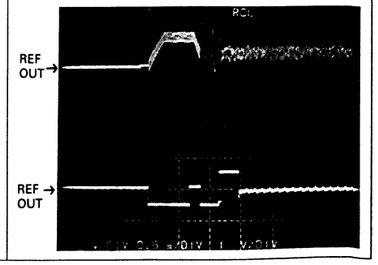


IC983:M62009P



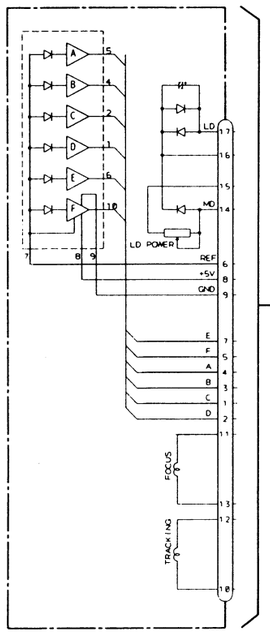
●Wave Forms

Note: 1. The encircled numbers denote measuring pointes in the circuit diagram.
2. Reference voltage
REFOUT: 2.5V

① RFO 0.5V/div. 0.5µs/div. Normal mode: play 	① CH1: RFO 1V/div. ② CH2: MIRR 5V/div. 0.5ms/div. Test mode: Tracking open 	① CH1: RFO 1V/div. ② CH2: MIRR 5V/div. 0.5ms/div. Normal mode: The defect part passes 800µm. 
③ CH1: FIN 1V/div. ④ CH2: FOUT+ 2V/div. 0.5s/div. Test mode: Connect the FEX to REFOUT. Focus search is performed. 	⑤ CH1: FOK 2V/div. ③ CH2: FIN 0.5V/div. 0.5s/div. Normal mode: Focus close 	⑥ CH1: FEY 1V/div. ⑦ CH2: XSO 2V/div. 2ms/div. Normal mode: Focus close (The lens moves DOWN → UP) 
⑧ CH1: TEY 1V/div. ⑨ CH2: TIN 0.5V/div. 0.5ms/div. Normal mode: Brake wave from when track search is perfromed. 	⑧ CH1: TEY 1V/div. ⑨ CH2: TIN 0.5V/div. 1ms/div. Normal mode: single jump 	⑧ CH1: TEY 0.5V/div. ⑨ CH2: TIN 0.5V/div. 5ms/div. Normal mode: Track search (32 track jump) 
⑥ CH1: FEY 0.2V/div. ③ CH2: FIN 0.5V/div. 20ms/div. Normal mode: Play 	③ CH1: FIN 0.5V/div. ⑩ CH2: SIN 1V/div. 0.5s/div. Normal mode: Focus search (12cm disc) 	③ CH1: FIN 0.5V/div. ⑩ CH2: SIN 1V/div. 0.5s/div. Normal mode: Focus search (8cm disc) 

5. CONNECTION DIAGRAM(1)

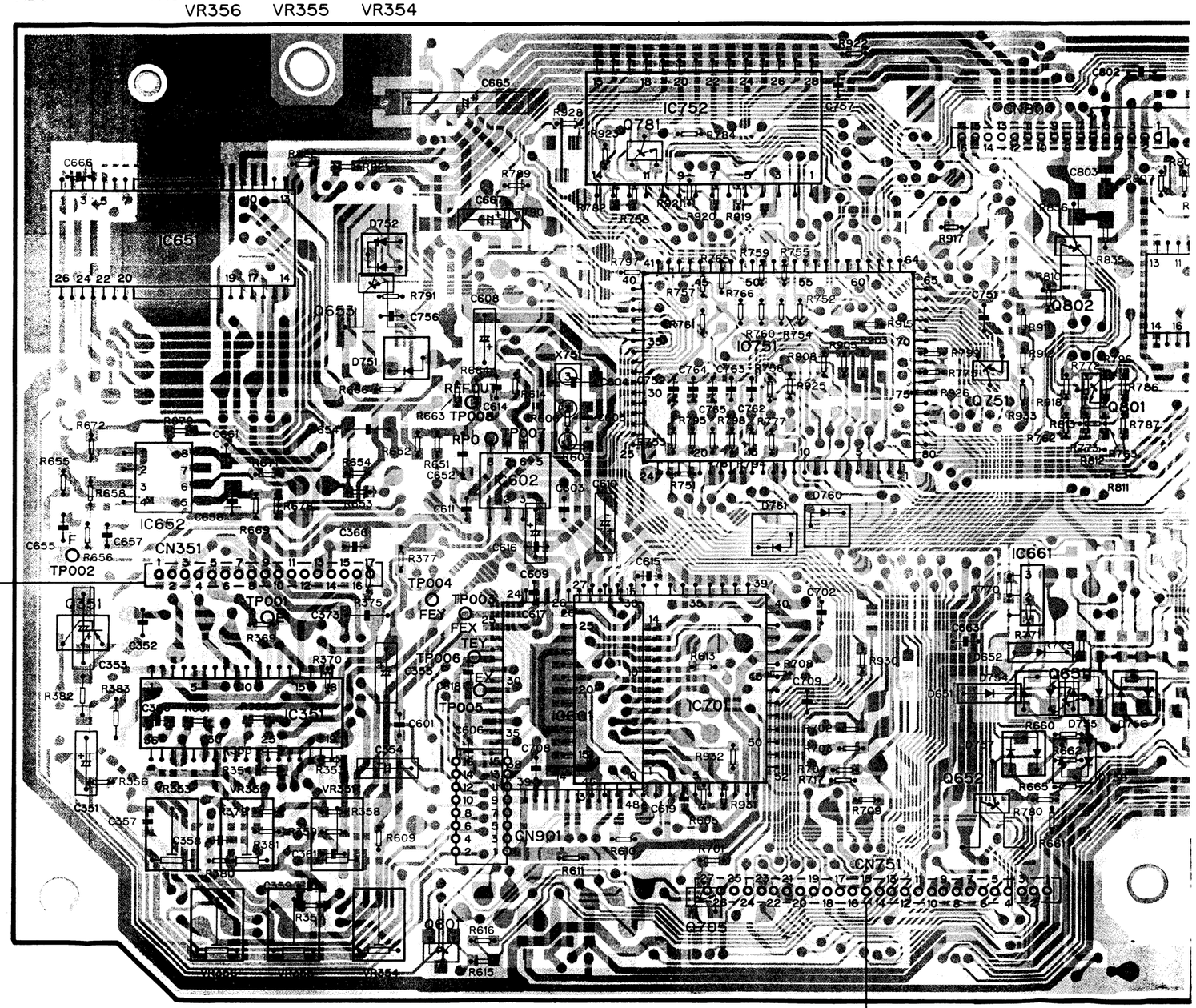
PU UNIT



MAIN UNIT

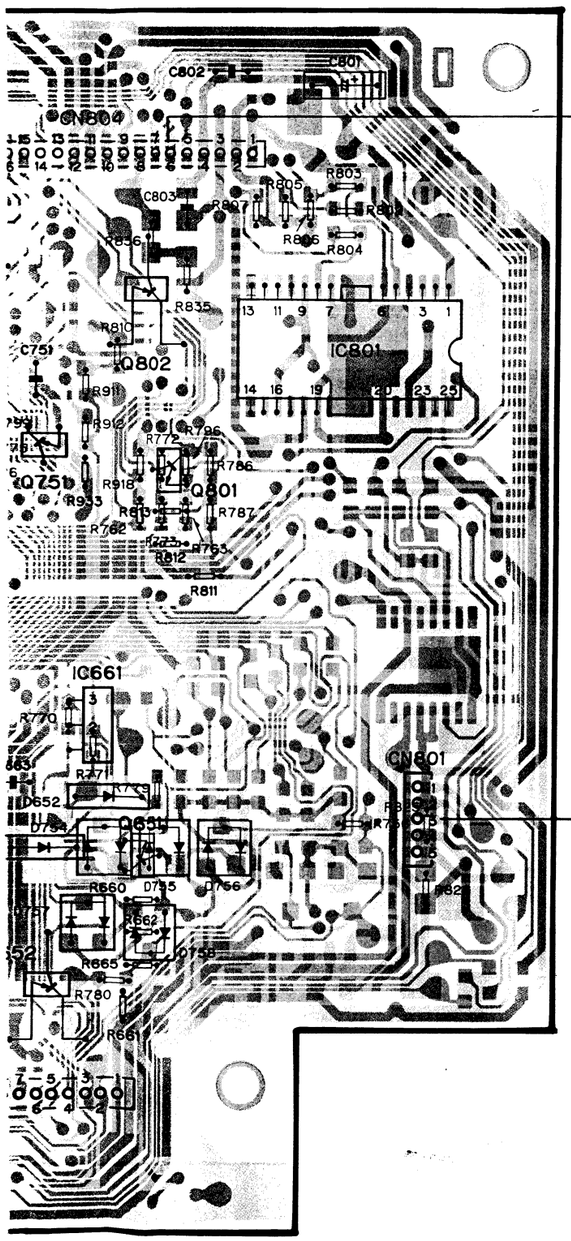
IC. Q Q351 IC651 IC652 IC351 Q653 Q601 IC602 IC601 Q781 IC752 IC701 IC751 Q705 Q751 Q652 Q802 Q801 IC661 Q651

ADJ VR353 VR352 VR351 VR356 VR355 VR354



IC801

Q751 Q802 Q801
Q652 IC661 Q651



MECHANISM P.C. BOARD

PHOTO P.C. BOARD

'ENSION P.C. BOARD
)84

MECHANISM P.C. BOARD

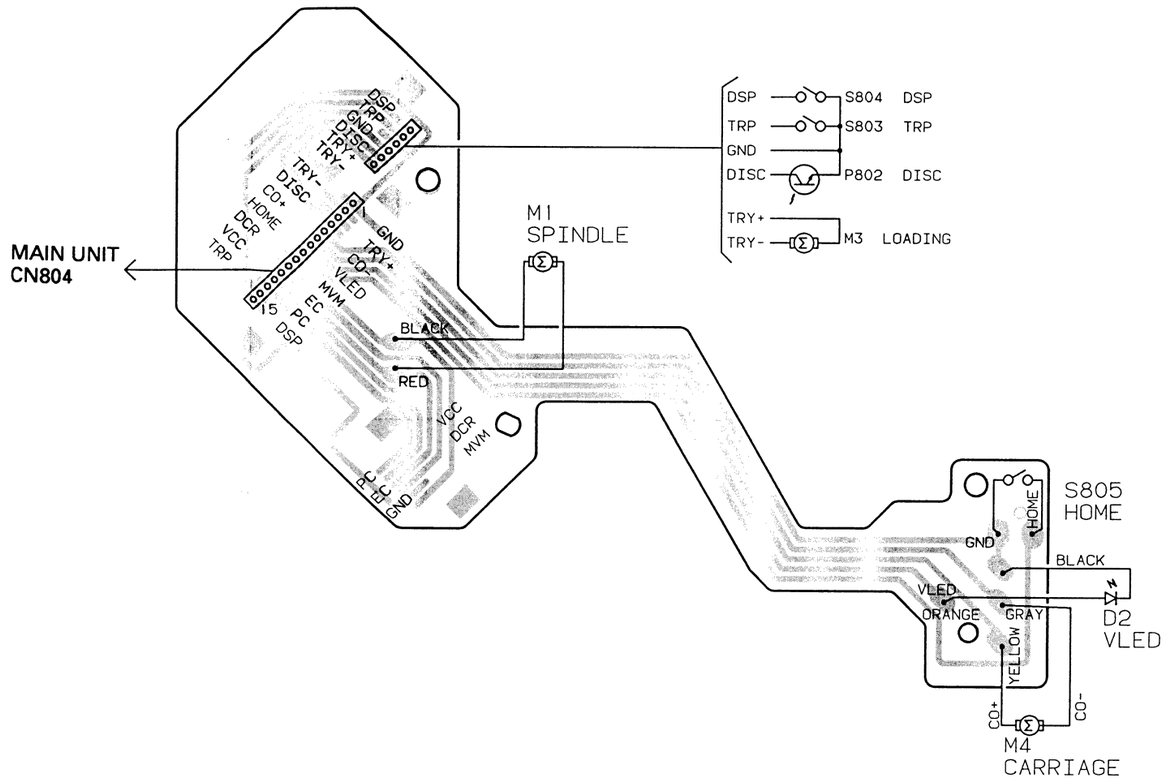


PHOTO P.C. BOARD

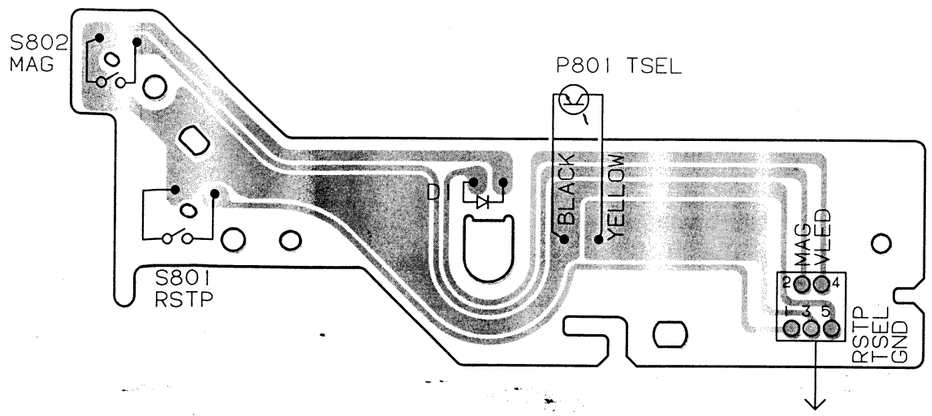


Fig. 11

6. SCHEMATIC CIRCUIT DIAGRAM(1)

SL SIGNAL LINE
F FOCUS SERVO LINE
T TRACKING SERVO LINE
C CARRIAGE SERVO LINE
S SPINDLE SERVO LINE

MAIN UNIT

PU UNIT(CGY1027)

LD DRIVE

RF AMP AUTO POWER CONTROL

IC351 UPC1347GS

REFOUT BUFFER TC602 NJM4558MD

FOCUS/TRACKING CARRIAGE SPINDLE DIGITAL SERVO PROCESSOR UPD6374AGH IC601

IC661 TA78L05F +5V REGULATOR

4CH LINEAR DRIVER IC651 PA3026

PVCC SWITCHING

LOW PASS FILTER

IC652 NJM4558MD (1/2)

IC652 NJM4558MD (2/2)

MOTOR DRIVER IC801 XRA6247FP

VD SENSE

IC751 PD5230A SYSTEM CONTROLLER

MECHANISM P.C. BOARD

SPINDLE CXA4540

CARRIAGE CXA4649

LOADING CXA5324

ELEVATION CXA5325

PHOTO P.C. BOARD

SWITCHES:
MECHANISM P.C.BOARD
S805: HOME SWITCH · ON–OFF
PHOTO P.C.BOARD
S801: RSTP SWITCH · ON–OFF
S802: MAG SWITCH · · ON–OFF
MISCELLANEOUS
S803: TRP SWITCH · · ON–OFF
S804: DSP SWITCH · · ON–OFF

The underlined indicates the switch position.

NOTE
⊏⊐ Symbol indicates a resistor.
No differentiation is made between chip resistors and discrete resistors.

⊣⊢ Symbol indicates a capacitor.
No differentiation is made between chip capacitors and discrete capacitors.

Decimal points for resistor and capacitor fixed values are expressed as.
2.2→2R2
0.022→R022

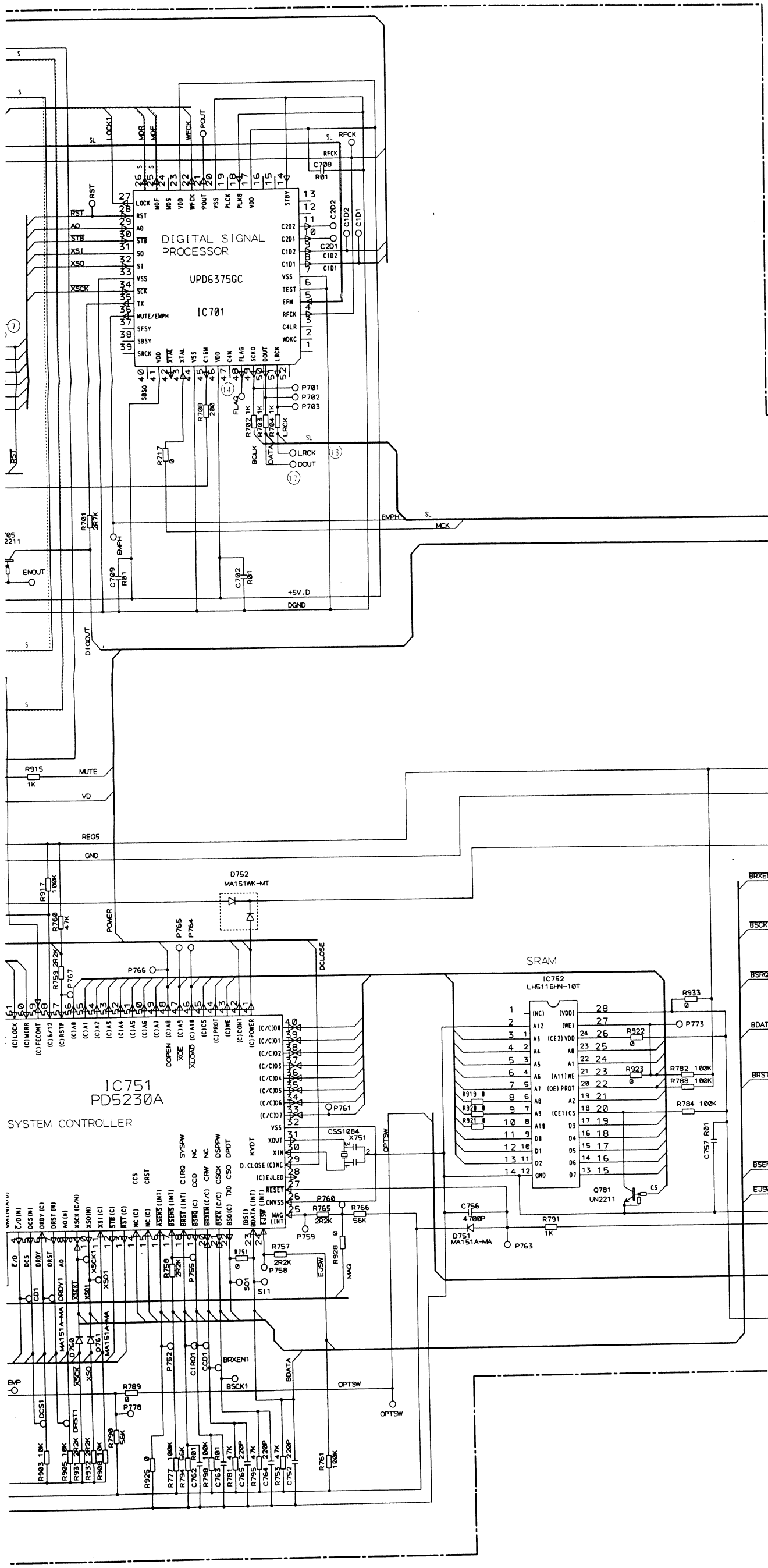
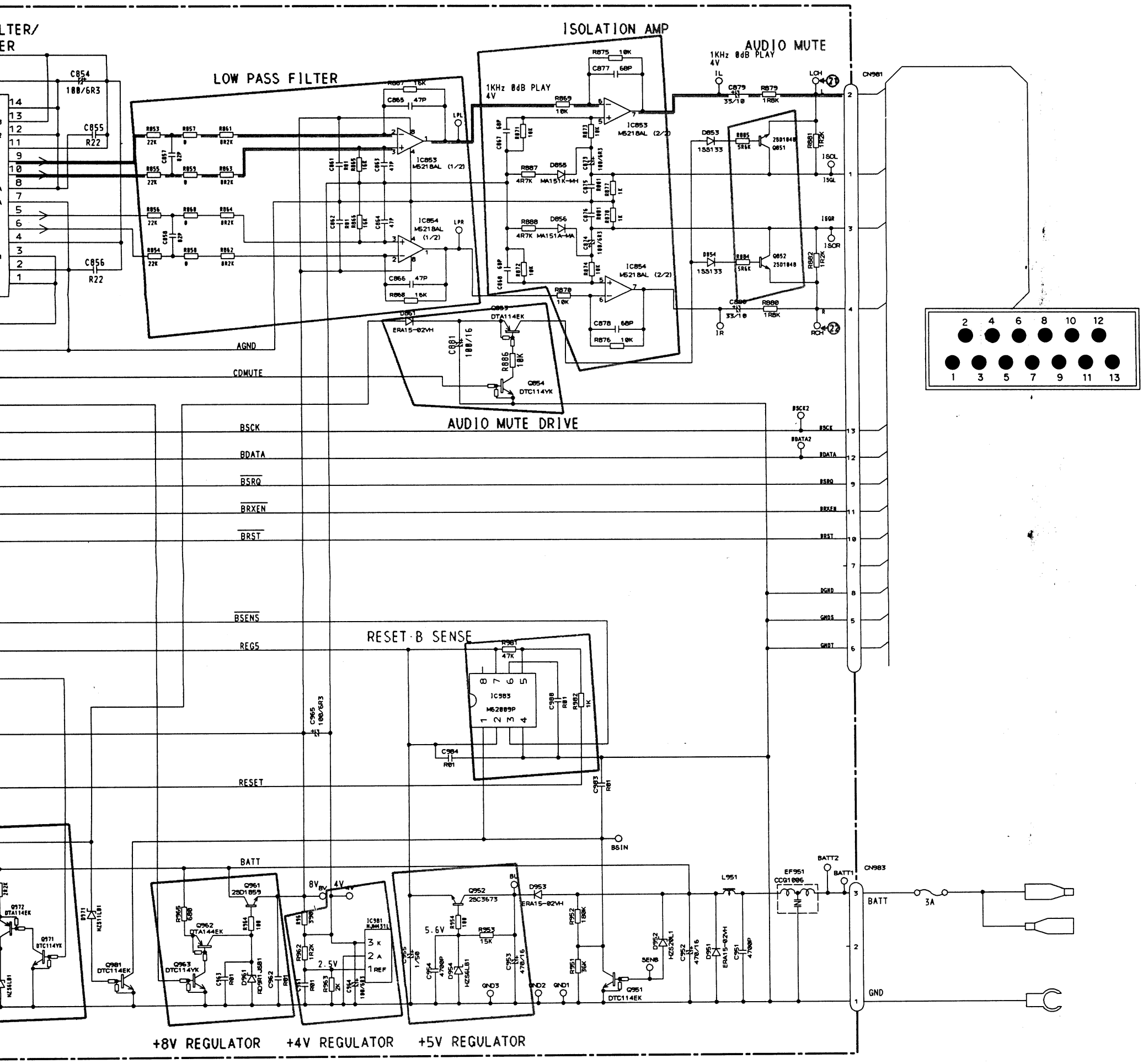


Fig. 12



NOTE :

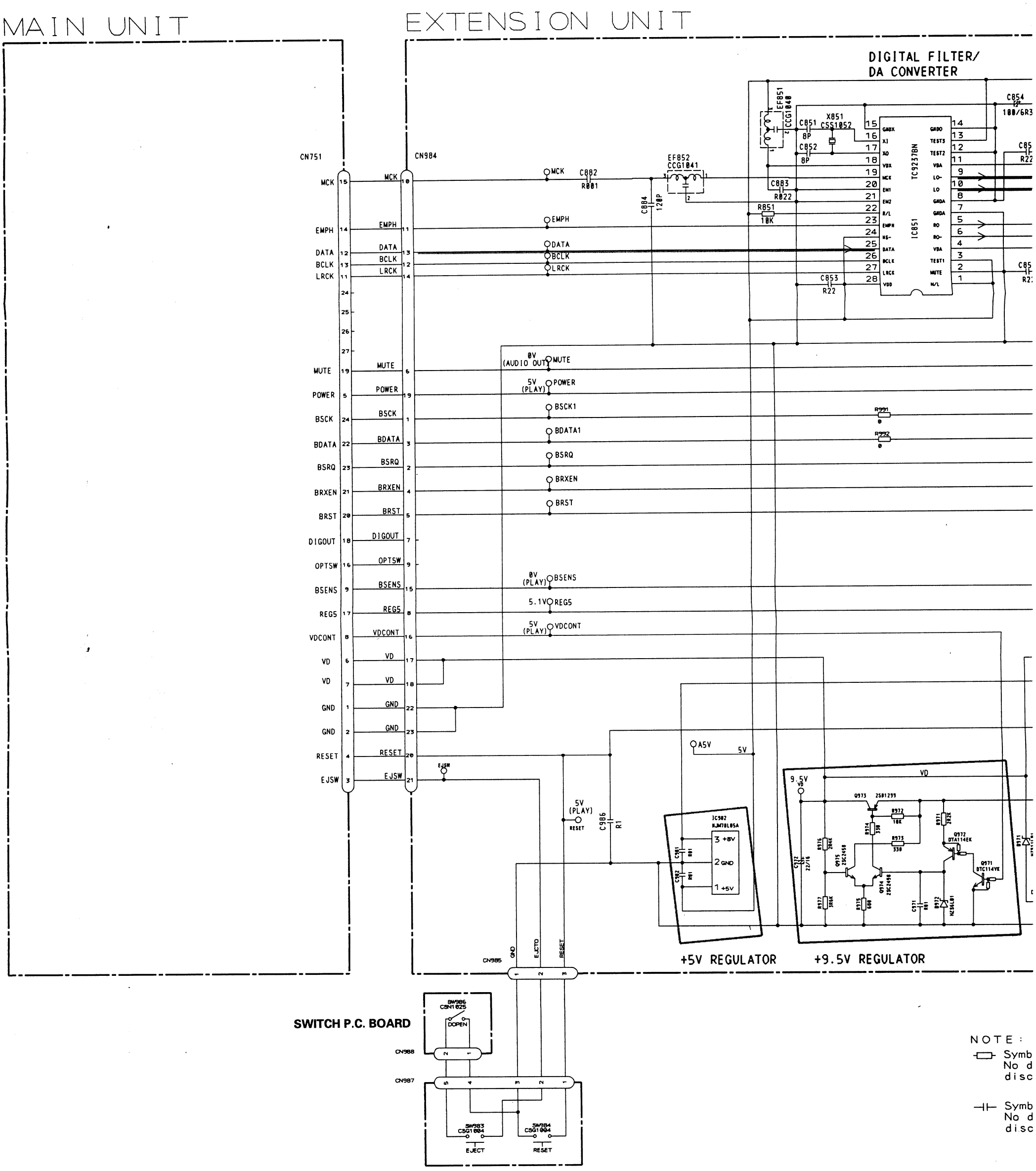
- Symbol indicates a resistor.
  No differentiation is made between chip resistors and discrete resistors.
- Symbol indicates a capacitor.
  No differentiation is made between chip capacitors and discrete capacitors.

Decimal points for resistor and capacitor fixed values are expressed as:
2.2→2R2
0.022→R022

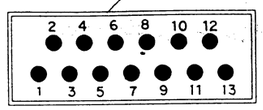
EXTENSION UNIT
Consists of EXTENSION P.C.BOARD KEY P.C.BOARD SWITCH P.C.BOARD

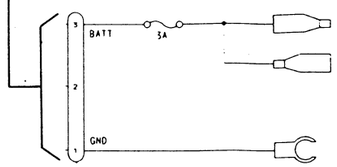
Fig. 13

7. SCHEMATIC CIRCUIT DIAGRAM(2)

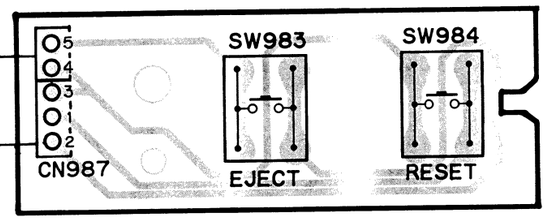


8. CONNECTION DIAGRAM(2)

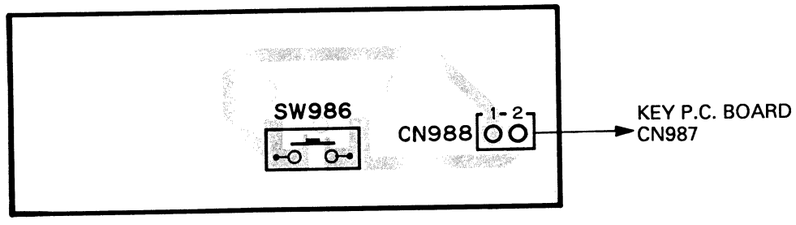




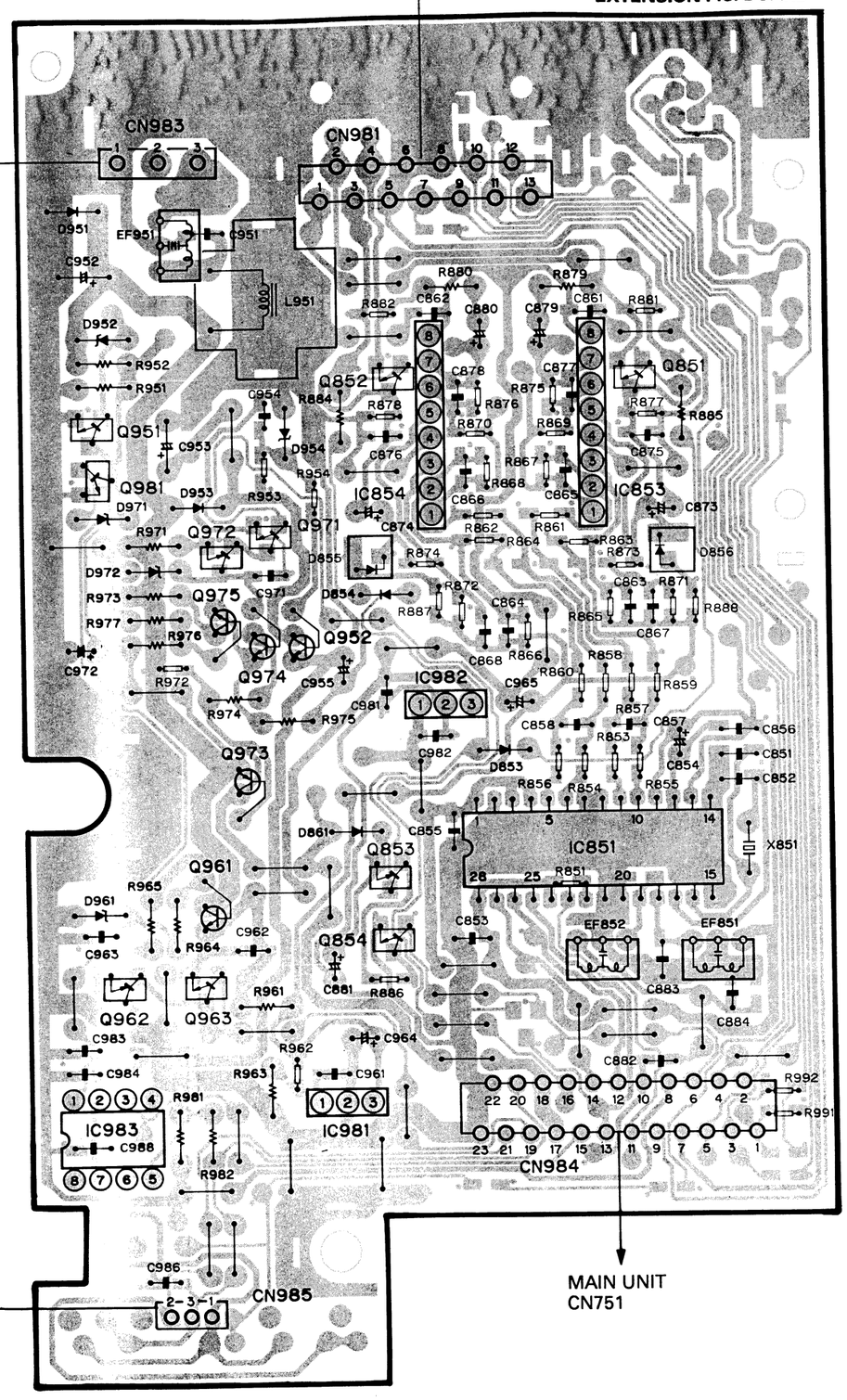
KEY P.C. BOARD



SWITCH P.C. BOARD



EXTENSION P.C. BOARD



IC. Q

A

Q852 Q851

Q951

Q981

IC854 IC853

Q971

Q972

Q975

Q974 Q952

IC982

Q973

IC851

Q853

Q961

Q854

Q962 Q963

IC981

IC983

Fig. 14

9. CHASSIS EXPLODED VIEW

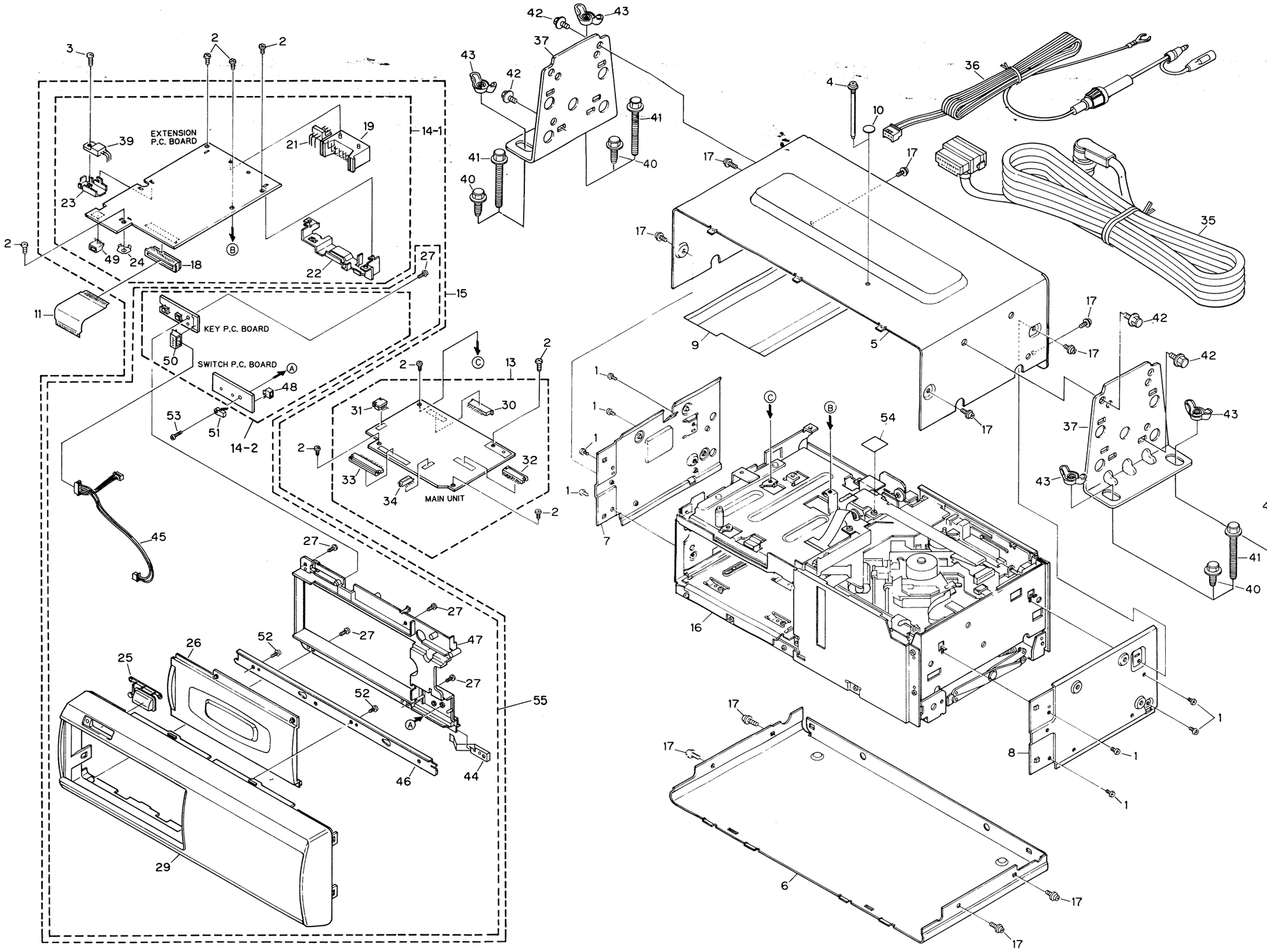


Fig. 15

NOTES:

●Parts marked by "*"are generally unavailable because they are not in our Master Spare Parts List.

●Parts marked by "⊙"are not always kept in stock. Their delivery time may be longer than usual or they may be unavailable.

● Parts List

Mark	No.	Description	Part No.
	1	Screw	BMZ26P030FMC
	2	Screw	PMS26P040FMC
	3	Screw(M2.6x8)	CBA1186
	4	Pin	CLA2163
	5	Upper Case	CNB1654
	6	Lower Case	CNB1656
	7	Bracket L	CNC5059
	8	Bracket R	CNC5053
*	9	Insulator	CNM3628
*	10	Sheal	CNM3648
	11	P.C.Board	CNP3138
	12	•••••	
⊙	13	Main Uniit	CWX1513
⊙	14	Extension Unit	CWX1568
	15	Grille Assy(UC)	CXA5544
		Grille Assy(EW)	CXA5533
⊙	16	CD Mechanism Unit	CXK2700
	17	Screw	PMS30P040FZK
	18	Connector(23P)(CN984)	CKS1543
	19	Connector(13P)(CN981)	CKS2101
	20	•••••	
	21	Plug(3P)(CN983)	CKS2372
	22	Connector Bracket	CNC4446
*	23	Heat Sink	CNC4447
*	24	Earth Plate	CNC4650
	25	Button	CAC3467
	26	Door	CAT1498
	27	Screw(M2.6x8)	CBA1161
	28	•••••	
	29	Grille	CNS2568
	30	Connector(15P)(CN804)	CKS1954
	31	Connector(5P)(CN801)	CKS1943
	32	Connector(17P)(CN351)	CKS1955
	33	Connector(27P)(CN751)	CKS1965
	34	Connector(16P)(CN901)	CKS2495
	35	DIN Cord	CDE4125
	36	Cord(UC)	CDE3741
		Cord(EW)	CDE3742
	37	Angle	CNB1763
	38	•••••	
	39	Transistor(Q973)	2SB1299
	40	Screw	CBA1069
	41	Screw	HMB60P500FZK
	42	Screw	HMF40P080FZK
	43	Nut	NR60FZK
	44	Spring	CBL1151
	45	Connector	CDE4117
	46	Bracket	CNC4469
	47	Guide	CNV3406
	48	Plug(2P)	CKS1049
	49	Plug(3P)	CKS1050
	50	Plug(5P)	CKS1635
	51	Switch(SW986)	CSN1025
	52	Screw	BPZ26P060FMC
	53	Screw(M2x12)	CBA1268
	54	Insulator	CNM3779
	55	Spare Assy(Grille Assy)(UC)	CXX1097
		Spare Assy(Grille Assy)(EW)	CXX1096

10. MAGAZINE ASSY (CXA5482) EXPLODED VIEW

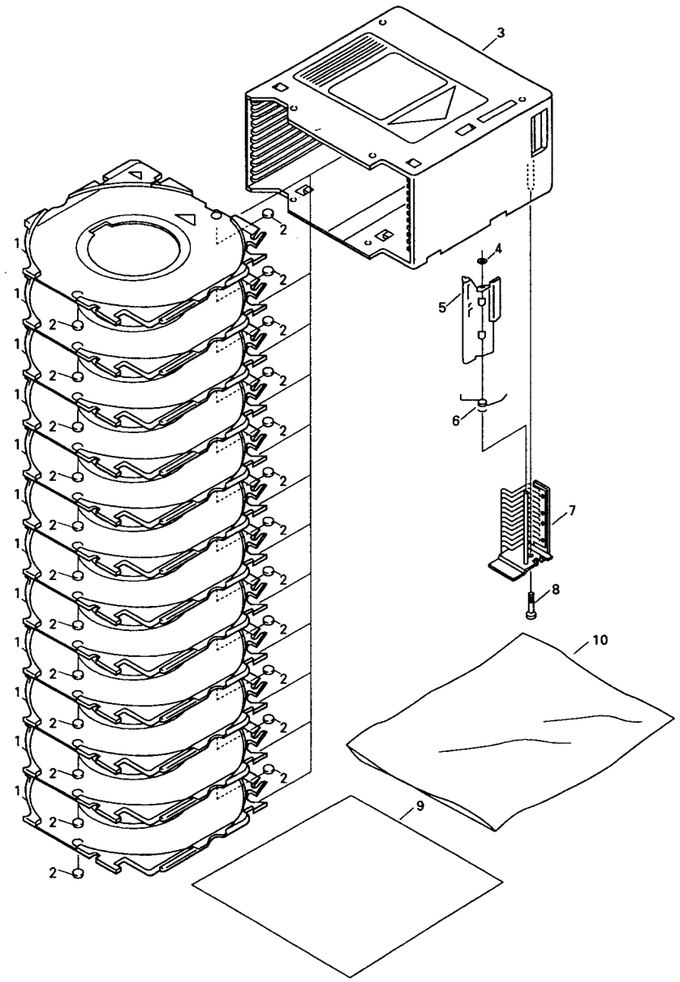


Fig.16

● Parts List

* Non Spare Part

Mark	No.	Description	Part No.
*	1	Tray	CNV3469
*	2	Cushion	CNM3622
*	3	Case Unit	CXA5474
	4	Washer	CBF1039
*	5	Arm	CNV3465
*	6	Spring	CBH1522
*	7	Bracket Unit	CXA5476
	8	Screw (M2x13)	CBA1272
*	9-1	Owner's Manual	CRD1638
*	9-2	Label	CRW1247
	10	Polyethylene Bag	E36-618

10. MAGAZINE ASSY (CXA5482) EXPLODED VIEW

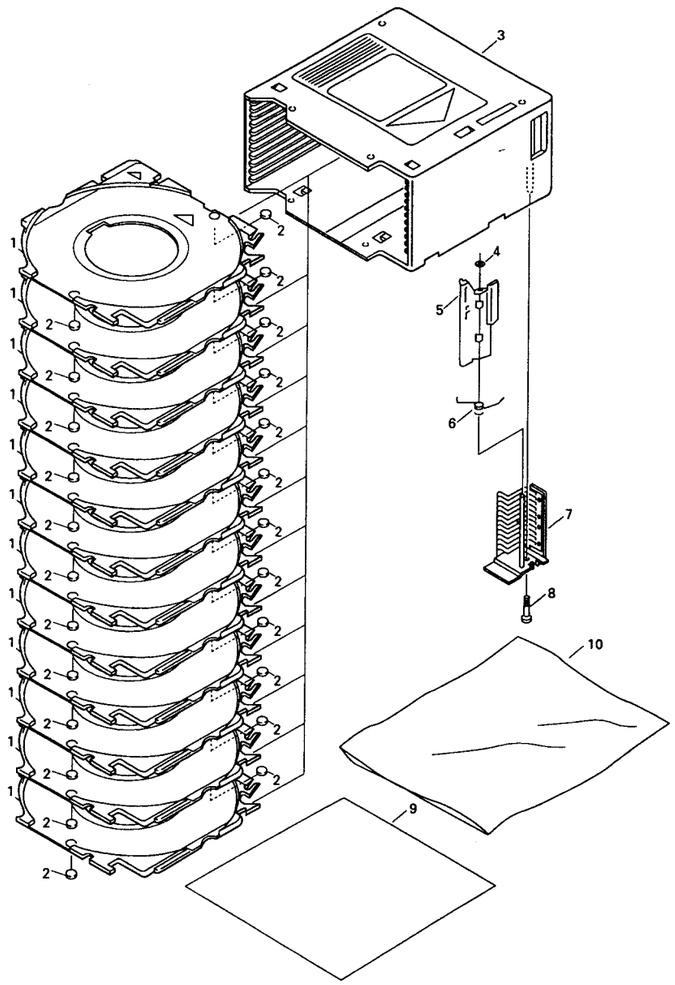


Fig.16

● Parts List

* Non Spare Part

Mark	No.	Description	Part No.
*	1	Tray	CNV3469
*	2	Cushion	CNM3622
*	3	Case Unit	CXA5474
	4	Washer	CBF1039
*	5	Arm	CNV3465
*	6	Spring	CBH1522
*	7	Bracket Unit	CXA5476
	8	Screw (M2x13)	CBA1272
*	9-1	Owner's Manual	CRD1638
*	9-2	Label	CRW1247
	10	Polyethylene Bag	E36-618

11. CD MECHANISM UNIT EXPLODED VIEW

● Parts List

Mark	No.	Description	Part No.
	1	Screw	BMZ20P025FMC
	2	Screw	BMZ20P030FMC
	3	•••••	
	4	Screw	BMZ26P030FMC
	5	Screw	BMZ26P050FMC
	6	LED (D1,2)	BR4361F
	7	Screw (M2x4)	CBA1015
	8	Screw (M2x2.5)	CBA1037
	9	Screw (M2x7)	CBA1060
	10	Screw (M2x3)	CBA1062
	11	Screw (M1.7x5.5)	CBA1070
	12	Screw (M2x3)	CBA1077
	13	•••••	
	14	Screw (M2x6)	CBA1229
	15	Screw (M2x2.5)	CBA1251
	16	Washer	CBF1037
	17	Washer	CBF1038
	18	Spring	CBH1430
	19	Spring	CBH1488
	20	Spring	CBH1489
	21	Spring	CBH1490
	22	Spring	CBH1491
	23	Spring	CBH1492
	24	Spring	CBH1493
	25	Spring	CBH1494
	26	Spring	CBH1495
	27	Spring	CBH1497
	28	Spring	CBH1498
	29	Spring	CBH1499
	30	Spring	CBH1500
	31	Spring	CBH1501
	32	Spring	CBH1503
	33	Spring	CBH1504
	34	Spring	CBH1505
	35	Spring	CBH1506
	36	Spring	CBH1537
	37	Spring	CBH1538
	38	Spring	CBH1563
	39	Spring	CBH1569
	40	Spring	CBL1138
	41	Spring	CBL1181
	42	Spring	CBL1156
	43	Spring	CBL1157
	44	Spring	CBL1158
	45	Connector(5P)	CDE3906
	46	PU Unit	CGY1027
	47	Connector (6P)	CKS1944
	48	Connector (15P)	CKS1953
	49	Connector (17P)	CKS1955
	50	Connector (5P)	CKS2208
	51	Shaft	CLA2027
	52	Shaft	CLA2123
	53	Shaft	CLA2126
	54	Roller	CLA2127
	55	Roller	CLA2159
	56	Shaft	CLA2160
	57	Collar	CLA2161
	58	Shaft	CLA2210
	59	Shaft	CLA2213
	60	Shaft	CLA2238
	61	Holder	CNC4073
	62	Weight	CNC4551
	63	Bracket	CNC4602
	64	Arm	CNC4606
	65	Holder	CNC4626
	66	Side Frame (L)	CNC4627
	67	R Frame	CNC4628
	68	Scale	CNC4629
	69	Bracket	CNC4630
	70	CM Bracket	CNC4631
	71	Bracket	CNC4632
	72	Arm	CNC4634
	73	Arm	CNC4635
	74	Arm	CNC4636
	75	TG Plate	CNC4637
	76	Bracket	CNC4642
	77	Frame	CNC4850
	78	Frame	CNC4854
	79	Cover	CNC4955
	80	Frame	CNC4967
	81	Spacer	CNM1787
	82	Sheet	CNM3567
	83	•••••	
	84	P.C.Board	CNP3222
	85	P.C.Board	CNP3225
	86	P.C.Board	CNP3226
	87	Ball	CNR1189
	88	Gear	CNR1289
	89	Gear	CNR1290
	90	Gear	CNR1304
	91	Guide	CNR1309
	92	Holder	CNR1310
	93	Holder	CNR1311
	94	Belt	CNT1047
	95	Holder	CNV3352
	96	Arm	CNV3354
	97	Lock	CNV3355
	98	Screw Bearing	CNV3356
	99	Holder	CNV3357
	100	Roller	CNV3358
	101	Cam	CNV3359
	102	Guide	CNV3360
	103	Guide	CNV3361
	104	Holder	CNV3362
	105	Holder	CNV3363
	106	•••••	
	107	Gear	CNV3366
	108	Gear	CNV3367
	109	Gear	CNV3368
	110	Gear	CNV3371
	111	TRYD Gear	CNV3372
	112	CUPM Gear	CNV3373
	113	Clamper UP Gear	CNV3374
	114	Guide	CNV3375
	115	Guide	CNV3376
	116	Arm	CNV3377
	117	Arm	CNV3378
	118	Guide	CNV3379
	119	Guide	CNV3380
	120	•••••	
	121	Gear	CNV3382
	122	Gear	CNV3383
	123	Gear	CNV3384
	124	Guide	CNV3385
	125	Arm	CNV3386
	126	Roller	CNV3387
	127	Wheel	CNV3526
	128	Arm	CNV3546
	129	Cover	CNV3547
	130	Holder	CNV3548
	131	Damper	CNV3549
	132	Holder	CNV3584
	133	Plate	CNV3629
	134	P.C.Board	CNP3227
	135	P.C.Board	CNP3393
	136	P.C.Board	CNP3540
	137	P.C.Board	CNP3217
	138	P.C.Board	CNP3218
	139	P.C.Board	CNP3219
	140	P.C.Board	CNP3220
	141	P.C.Board	CNP3221
	142	Switch (S801,802,803,804,805)	CSN1012
	143	Motor Unit (Spindle) (M1)	CXA4540
	144	Motor Unit (Carriage) (M4)	CXA4649
	145	Stage Chassis Unit	CXA5287
	146	•••••	
	147	Mode Ring Unit	CXA5288
	148	Steer R Unit	CXA5289
	149	LM Bracket Unit	CXA5290
	150	Rink Unit	CXA5291
	151	Lever Unit	CXA5292
	152	Arm Unit	CXA5293
	153	Gear Arm Unit	CXA5294
	154	Arm Unit	CXA5295
	155	Plate Unit	CXA5296
	156	TG Bracket Unit	CXA5297
	157	CRG Chassis Unit	CXA5298
	158	Bracket Unit	CXA5299
	159	Arm Unit	CXA5300
	160	Arm Unit	CXA5301

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Mark	No.	Description	Part No.
	81	Spacer	CNM1787
	82	Sheet	CNM3567
	83	•••••	
	84	P.C.Board	CNP3222
	85	P.C.Board	CNP3225
	86	P.C.Board	CNP3226
	87	Ball	CNR1189
	88	Gear	CNR1289
	89	Gear	CNR1290
	90	Gear	CNR1304
	91	Guide	CNR1309
	92	Holder	CNR1310
	93	Holder	CNR1311
	94	Belt	CNT1047
	95	Holder	CNV3352
	96	Arm	CNV3354
	97	Lock	CNV3355
	98	Screw Bearing	CNV3356
	99	Holder	CNV3357
	100	Roller	CNV3358
	101	Cam	CNV3359
	102	Guide	CNV3360
	103	Guide	CNV3361
	104	Holder	CNV3362
	105	Holder	CNV3363
	106	•••••	
	107	Gear	CNV3366
	108	Gear	CNV3367
	109	Gear	CNV3368
	110	Gear	CNV3371
	111	TRYD Gear	CNV3372
	112	CUPM Gear	CNV3373
	113	Clamper UP Gear	CNV3374
	114	Guide	CNV3375
	115	Guide	CNV3376
	116	Arm	CNV3377
	117	Arm	CNV3378
	118	Guide	CNV3379
	119	Guide	CNV3380
	120	•••••	

Mark	No.	Description	Part No.
	121	Gear	CNV3382
	122	Gear	CNV3383
	123	Gear	CNV3384
	124	Guide	CNV3385
	125	Arm	CNV3386
	126	Roller	CNV3387
	127	Wheel	CNV3526
	128	Arm	CNV3546
	129	Cover	CNV3547
	130	Holder	CNV3548
	131	Damper	CNV3549
	132	Holder	CNV3584
	133	Plate	CNV3629
	134	P.C.Board	CNP3227
	135	P.C.Board	CNP3393
	136	P.C.Board	CNP3540
	137	P.C.Board	CNP3217
	138	P.C.Board	CNP3218
	139	P.C.Board	CNP3219
	140	P.C.Board	CNP3220
	141	P.C.Board	CNP3221
	142	Switch (S801,802,803,804,805)	CSN1012
	143	Motor Unit (Spindle) (M1)	CXA4540
	144	Motor Unit (Carriage) (M4)	CXA4649
	145	Stage Chassis Unit	CXA5287
	146	•••••	
	147	Mode Ring Unit	CXA5288
	148	Steer R Unit	CXA5289
	149	LM Bracket Unit	CXA5290
	150	Rink Unit	CXA5291
	151	Lever Unit	CXA5292
	152	Arm Unit	CXA5293
	153	Gear Arm Unit	CXA5294
	154	Arm Unit	CXA5295
	155	Plate Unit	CXA5296
	156	TG Bracket Unit	CXA5297
	157	CRG Chassis Unit	CXA5298
	158	Bracket Unit	CXA5299
	159	Arm Unit	CXA5300
	160	Arm Unit	CXA5301

Mark	No.	Description	Part No.
	161	Screw Unit	CXA5302
	162	Arm Unit	CXA5303
	163	Bracket Unit	CXA5304
	164	Bracket Unit	CXA5305
	165	Holder Unit	CXA5308
	166	Frame Unit	CXA5310
	167	Arm Unit	CXA5311
	168	Arm Unit	CXA5313
	169	Bracket Unit	CXA5314
	170	Arm Unit	CXA5315
	171	Main Frame Unit	CXA5316
	172	Lever Unit	CXA5317
	173	Magazine Holder Unit	CXA5318
	174	Upper Frame Unit	CXA5319
	175	Bracket Unit	CXA5322
	176	Motor Unit (Loading) (M3)	CXA5324
	177	Gear	CNV3365
*	178	Motor	CXM1069
	179	Motor Unit (Elevation) (M2)	CXA5325
	180	Gear	CNV3381
*	181	Motor	CXM1061
	182	Whom Bracket Unit	CXA5326
	183	Arm Unit	CXA5561
	184	Damper Unit	CXA5631
	185	Clamper	HEF-102

Mark	No.	Description	Part No.
	186	Screw	JFZ14P016FNI
	187	•••••	
	188	•••••	
	189	•••••	
	190	Screw	JFZ20P025FNI
	191	Screw	JGZ20P070FNI
	192	Screw	PMS20P025FMC
	193	Photo Transistor (P801,802)	PT4800
	194	Washer	YE15FUC
	195	Washer	YE20FUC
	196	Washer	YE25FUC
	197	Sheet	CNM3798
	198	Bracket	CNC5028
	199	Insulator	CNM3786
	200	Sheet	CNM3817
	201	Screw	BMZ26P040FMC
	202	Screw (M2x2.5)	CBA1041
	203	Screw (M2.6x3)	CBA1065
	204	•••••	
	205	Screw	JFZ17P025FNI
	206	Screw	JFZ17P035FNI
	207	Screw	JFZ20P030FNI
	208	Sheet	CNM3826
	209	Roller	CLA2266
	210	Spring	CBH1579
	211	Washer	CBE-112

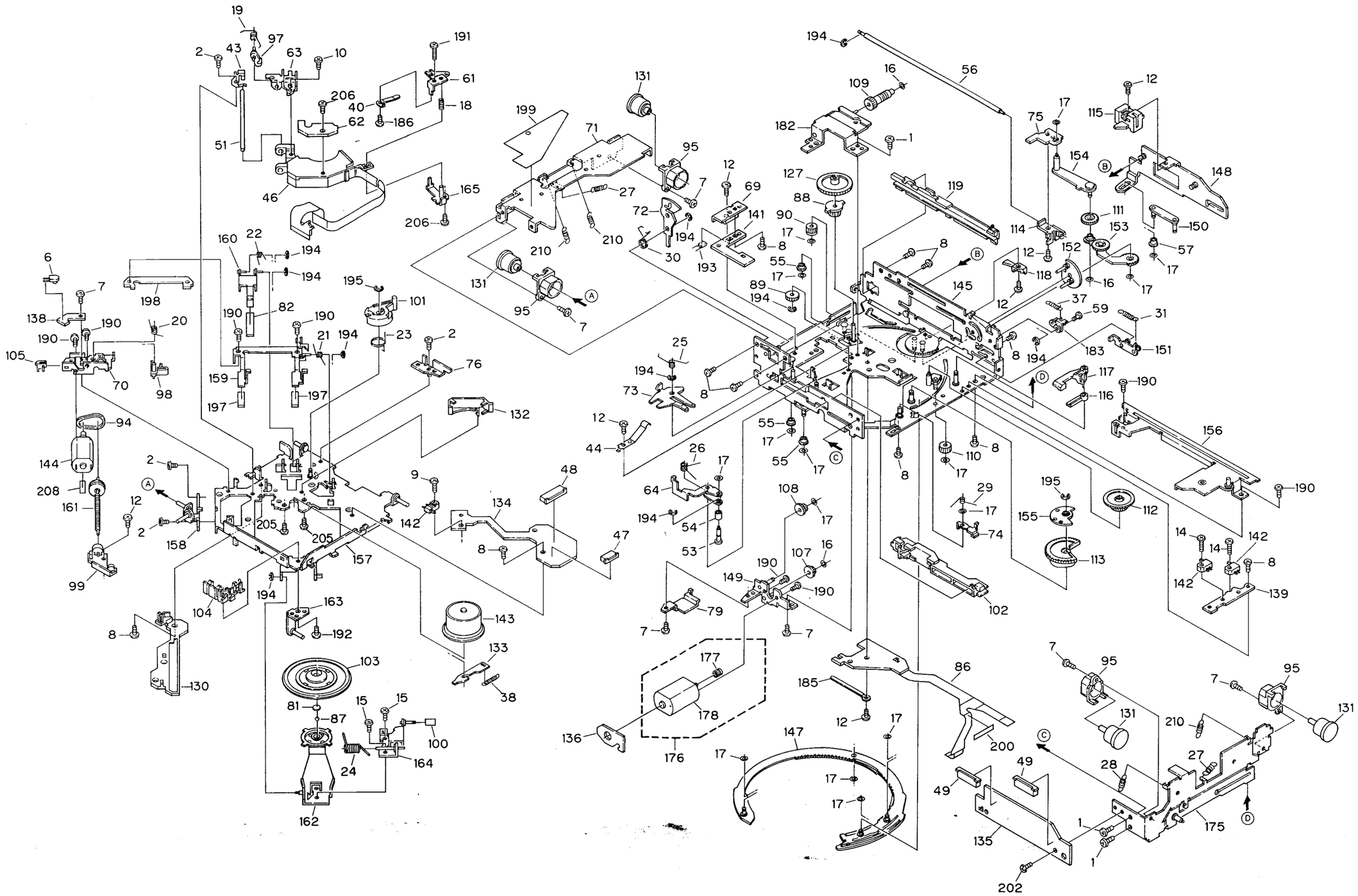
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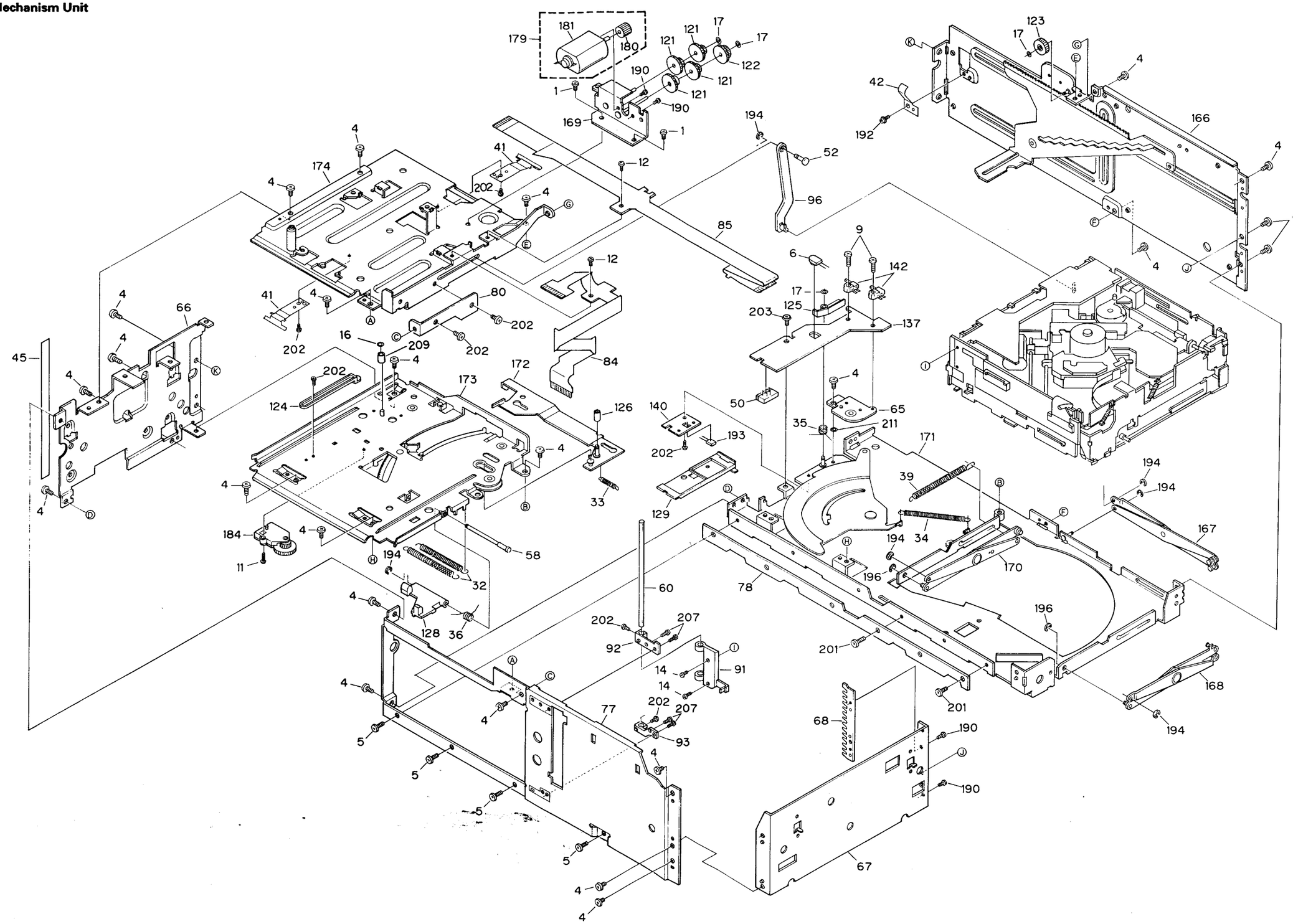
Fig. 17

●CD Mechanism Unit



12. PACKING METHOD

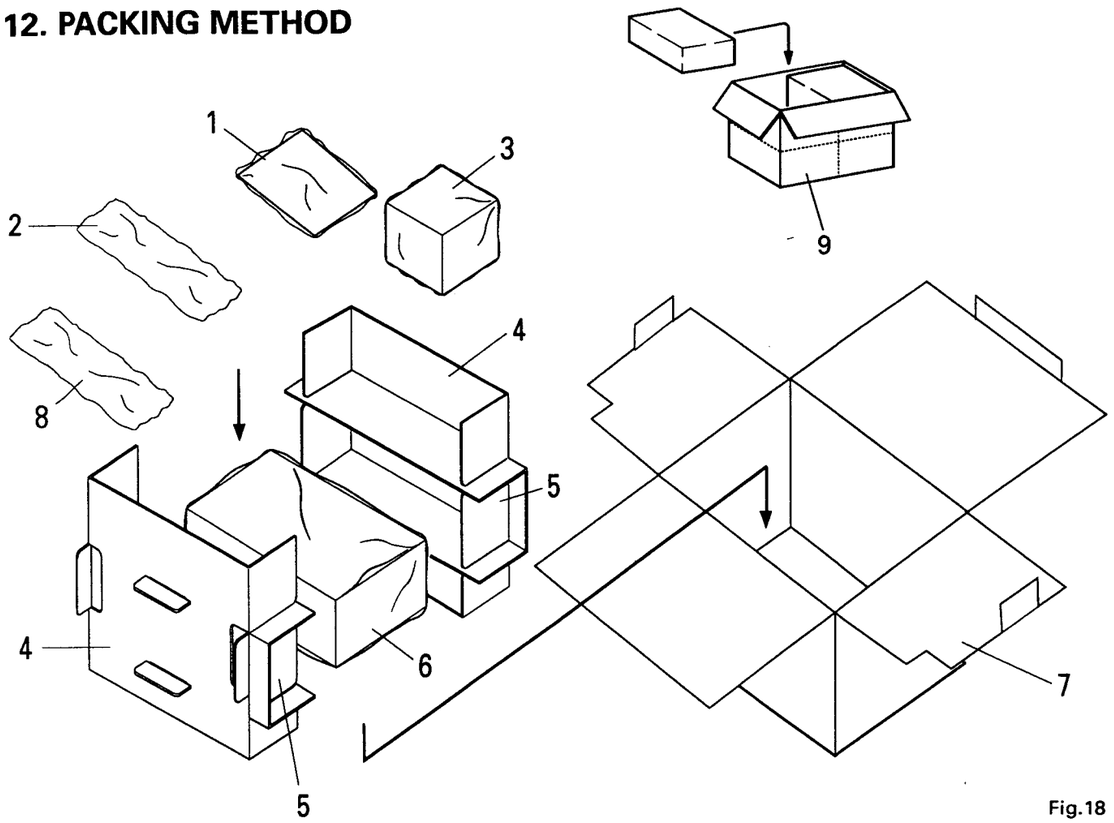


Fig.18

● Parts List

Mark	No.	Description	Part No.
	1-1	Owner's Manual(UC)	CRD1642
		Owner's Manual(EW)	CRD1640
		Owner's Manual(EW)	CRD1641
*	1-2	Card(UC)	ARY1048
*		Card(EW)	CRY-062
	2	Accessory Assy(UC)	CEA1797
		Accessory Assy(EW)	CEA1795
	2-1	Cord(UC)	CDE3741
		Cord(EW)	CDE3742
	2-2	Screw Assy	CEA1788
	2-2-1	Screw(x4)	CBA1069
*	2-2-2	Polyethylene Bag	E36-615
	2-2-3	Screw(x4)	HMB60P500FZK
	2-2-4	Screw(x4)	HMF40P080FZK
	2-2-5	Nut(x4)	NR60FZK

* Non Spare Part

Mark	No.	Description	Part No.
	2-3	Angle(x2)	CNB1763
*	2-4	Polyethylene Bag	E36-622
	3	Magazine Assy	CXA5482
	4	Protector	CHP1537
	5	Protector	CHP1536
	6	Cover	CEG1082
		Caution Card	CRP1112
*		Sheal	CNM3648
	7	Carton(UC)	CHG2300
		Carton(EW)	CHG2299
	8	DIN Cord	CDE4125
	9	Contain Box(UC)	CHL2300

1-1 Owner's Manual

Part No.	Model	Language
CRD1642	CDX-M12/UC	English,French
CRD1640	CDX-M12/EW	English,Italian,French, German,Dutch
CRD1641	CDX-M12/EW	Spanish,Portuguese, Swedish,Norwegian, Finnish

13. ELECTRICAL PARTS LIST

NOTE:

- *Parts whose parts numbers are omitted are subject to being not supplied.*
- *The part numbers shown below indicate chip components.*

Chip Resistor
RS1/OSOOOJ,RS1/OOSOOOJ
Chip Capacitor (except for CQS.....)
CKS....., CCS....., CSZS.....

Circuit Symbol & No.	Part Name	Part No.
Unit Number :		
Unit Name : Main Unit		
MISCELLANEOUS		
IC 351		UPC1347GS
IC 601		UPD6374AGH
IC 602 652		NJM4558MD
IC 651		PA3026
IC 661		TA78L05F
IC 701		UPD6375GC
IC 751		PD5230A
IC 752		LH5116HN-10T
IC 801		XRA6247FP
Q 351		2SB1260
Q 601		2SB709A
Q 651 801		UN2211
Q 652		2SB1184F5
Q 653		2SB1184F5
Q 705 781		UN2211
Q 751		UN2111
Q 802		2SB1184F5
D 651 652		SC016-2
D 751 760 761		MA151A-MA
D 752		MA151WK-MT
D 754 755 756 757 758		MA153-MC
X 751		CSS1084
VR 351 352 355	Semi-fixed 47kΩ(B)	CCP1023
VR 353 356	Semi-fixed 2.2kΩ(B)	CCP1015
VR 354	Semi-fixed 22kΩ(B)	CCP1021
	Checker Chip	CKF1025
RESISTORS		
R 353		RS1/16S623J
R 354 753 760 781 795 797		RS1/16S473J
R 355		RS1/16S122J
R 356 357 658		RS1/16S683J
R 358 359		RS1/16S332J
R 360		RS1/16S684J
R 361		RS1/16S153J
R 369 605 607 610 666 775 903		RS1/16S103J
R 370 381		RS1/16S133J
R 375 377 609 613 651 663 671 672		RS1/16S102J
R 379		RS1/16S513J
R 380 754 761 772 777 782 784 788 796 798		RS1/16S104J
R 382		RS1/8S100J
R 383		RS1/8S120J
R 606		RS1/16S224J
R 611 791		RS1/16S102J
R 614 664		RS1/16S912J
R 615 616 810		RS1/16S472J
R 652		RS1/16S162J
R 653		RS1/16S222J

Circuit Symbol & No.	Part Name	Part No.
R 654		RS1/16S332J
R 655		RS1/16S362J
R 656		RS1/16S183J
R 660 662 665 811 812 813		RS1/10S131J
R 661		RS1/16S472J
R 669		RS1/16S183J
R 678		RS1/16S103J
R 679		RS1/16S333J
R 701		RS1/16S272J
R 702 703 704 802 803 804 915		RS1/16S102J
R 708		RS1/16S201J
R 709 751 789 821 822 919 920 921 923		RS1/16S0R0J
R 717 922 933		RS1/16S0R0J
R 752		RS1/16S223J
R 755 757 758 759 762 763 765 773 787 931		RS1/16S222J
R 756 770 771 779 780		RS1/16S681J
R 766 786 794 805 806 807		RS1/16S563J
R 790		RS1/16S563J
R 799 926		RS1/16S104J
R 825 826 835 836		RS1/10S241J
R 905 908 912		RS1/16S103J
R 911		RS1/16S433J
R 917		RS1/16S104J
R 918		RS1/16S154J
R 925 928 930		RS1/16S0R0J
R 932		RS1/16S222J
CAPACITORS		
C 351		CEV470M6R3
C 352 751		CKSQYB104K16
C 353		CEV101M6R3
C 354 355 609 610		CEV100M16
C 357 359 366		CKSRYB102K50
C 358 603		CKSRYB331K50
C 360		CKSRYB271K50
C 361		CCSRCH220J50
C 373		CKSYB224K16
C 601		CKSRYB222K50
C 604 652 654		CKSYB224K16
C 605 606 611 615 616 618 619 661 666 762		CKSRYB103K50
C 608		CEV100M16
C 614		CKSRYB821K50
C 617 702 708 709 757		CKSRYB103K50
C 655		CKSQYB333K25
C 657		CKSRYB391K50
C 658		CKSQYB272K50
C 663		CKSQYB333K25
C 665	400μF/10V	CCH1120
C 667		CEV220M16
C 752 764 765		CCSRCH221J50
C 756		CKSRYB472K50
C 763		CKSRYB103K50
C 801		CEV220M16

=====Circuit Symbol & No.	Part Name=====		Part No.
C 802			CKSQYB223K25
C 803			CKSQYB223K25

Extension Unit
Consists of •Extension P.C.Board •Key P.C.Board •Switch P.C.Board

Unit Number :
Unit Name : Extension Unit

MISCELLANEOUS

IC	851		TC9237BN
IC	853	854	M5218AL
IC	981		NJM431L
IC	982		NJM78L05A
IC	983		M62009P
Q	851	852	2SD1048
Q	853		DTA114EK
Q	854	963 971	DTC114YK
Q	951		DTC114EK
Q	952		2SC3673
Q	961		2SD1859
Q	962		DTA144EK
Q	972		DTA114EK
Q	973		2SB1299
Q	974	975	2SC2458
Q	981		DTC114EK
D	853	854	1SS133
D	855		MA151K-MH
D	856		MA151A-MA
D	861	951 953	ERA15-02VH
D	952		HZS20L1
D	954	972	HZS6LB1
D	961		RD9R1JSB1
D	971		HZS11LB1
L	951	Choke Coil	CTH1047
X	851	Crystal Resonator	CSS1052
SW	983	984 Switch (EJECT,RESET)	CSG1004
EF	851	EMI Filter	CCG1040
EF	852	EMI Filter	CCG1041
EF	951	EMI Filter	CCG1006

RESISTORS

R	851	972	RS1/10S103J
R	853	854 855 856	RS1/10S223J
R	857	858 859 860	RS1/8S0R0J
R	861	862 863 864	RS1/8S822J
R	865	866	RS1/10S163J
R	867	868	RS1/10S163J
R	869	870 871 872 873 874 875 876	RN1/10SE103D
R	877	878	RS1/10S102J
R	879	880	RD1/4PS182JL
R	881	882	RS1/10S122J
R	884	885	RD1/4PS562JL
R	886		RS1/8S103J
R	887	888	RS1/10S472J
R	951		RD1/4PS363JL
R	952		RD1/4PS184JL
R	953		RS1/10S153J
R	954		RS1/10S101J
R	961		RD1/4PS391JL
R	962		RS1/10S122J
R	963		RD1/4PS202JL

=====Circuit Symbol & No.	Part Name=====		Part No.
R 964			RD1/4PS101JL
R 965	975		RD1/4PS681JL
R 971			RD1/4PS222JL
R 973	974		RD1/4PS331JL
R 976			RD1/4PS242JL
R 977			RD1/4PS362JL
R 981			RD1/4PS473JL
R 982			RD1/4PS102JL
R 991	992		RS1/10S0R0J

CAPACITORS

C	851	852	CCSCH080D50
C	853	855 856	CKSYB224K25
C	854		CEA101M6R3LS
C	857	858	CCSQCH820J50
C	861	862 961 962 963 971 981 982 983 984	CKSQYB103K25
C	863	864	CCSQCH470J50
C	865	866	CCSQCH470J50
C	867	868	CCSQCH680J50
C	873	874	CEA101M6R3LL
C	875	876 882	CCSQSL102J50
C	877	878	CCSQCH680J50
C	879	880	CEA330M10LL
C	881		CEA101M16LL
C	883		CKSQYB223K50
C	884		CCSQCH121J50
C	951	954	CKSQYB472K50
C	952	953	CEAS471M16
C	955		CEA010M50LS
C	964	965	CEA101M6R3LL
C	972		CEA220M16LL
C	986		CKSQYB104K25
C	988		CKSYB103K25

Unit Number :
Unit Name : Mechanism P.C.Board

S	805	Switch	CSN1012

Unit Number :
Unit Name : Photo P.C.Board

D	1	LED	BR4361F
S	801	802 Switch	CSN1012

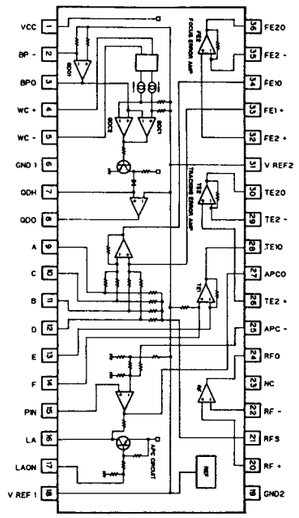
Miscellaneous Parts List

SW	986	Switch (DOPEN)	CSN1025
D	2	LED	BR4361F
S	803	804 Switch	CSN1012
P	801	802 Photo Transistor	PT4800
M	1	Motor Unit (Spindle)	CXA4540
M	2	Motor Unit (Elevation)	CXA5325
M	3	Motor Unit (Loading)	CXA5324
M	4	Motor Unit (Carriage)	CXA4649
		PU Unit	CGY1027

14. CIRCUIT DESCRIPTION

1. Preamplifier Stage

This unit processes a pickup output signal to make signals for subsequent stages, i.e. servo unit, modulator unit and control unit. The signal from the pickup is converted on an I-V basis in a photodetector-builtin preamplifier inside the pickup.
Besides, an addition is made to the signal in an RF amplifier (IC351) to obtain RF, FE and TE signals.
The preamplifier unit has a configuration with one-chip IC UPD1347GS mainly employed. It is described in detail below.
The present system, which is of single power (+5 V) type, has 2.5 volts available for both RF Amplifier Reference Voltage Vref and other signal circuit reference voltage REFOUT. Voltages referred to below are to be expressed in Unit [REFOUT]. (A voltage based on a reference value of 0 (V) is to be expressed in Unit [V] .)
The IC is a 36-pin flat package, which has an internal configuration as shown in Fig. 19.
This IC is described below concerning its internal component parts.
(NOTE) Pin ⑱ on IC351 has Vref (2.5 V), which in turn serves as the reference voltage in the RF amplifier. For measurements, adjustments, etc., apply REFOUT obtained by passing REFO of Pin ⑲ on IC601 through a buffer.



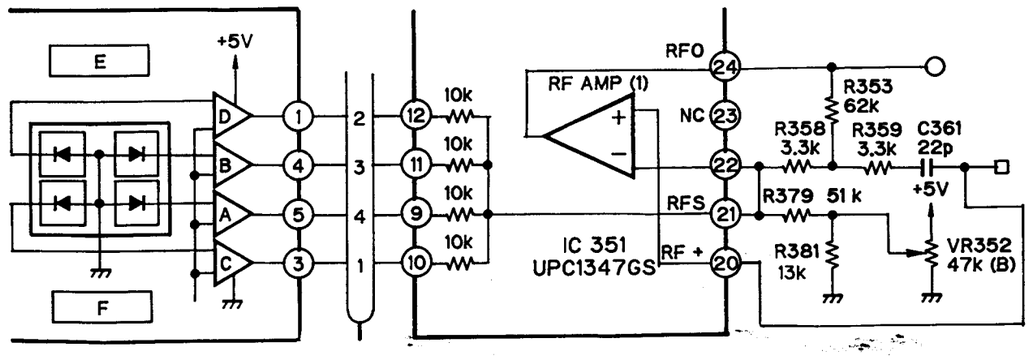
Block diagram Fig. 19

(1) RF amplifier

Photodetector Outputs A, B, C and D are added in amplifier (1) so that (A + B + C + D) will be outputted to RFO. (This terminal permits an eye pattern to be checked.) RFO output voltage VRFO has lowfrequency components as follows:

$$VRFO\ (REFOUT) = -[(R358 + R353)/10\ k] \times (A + B + C + D)$$

For RFO output (Pin ㉔, an RF output at a level of VRFO = 1.9 Vp-p', AC., is available, with REFOUT at the center.



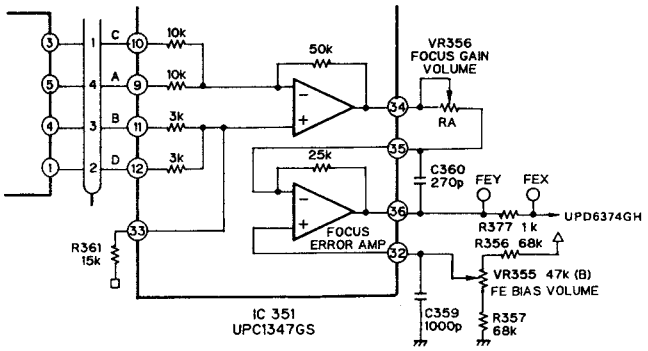
Block diagram Fig. 20

(2) Focus error amplifier

Photodetector outputs A, B, C and D are inputted to both differential and focus-error amplifiers so that A + C − B − D will be outputted.
An FE output volatage (low frequency) will be :

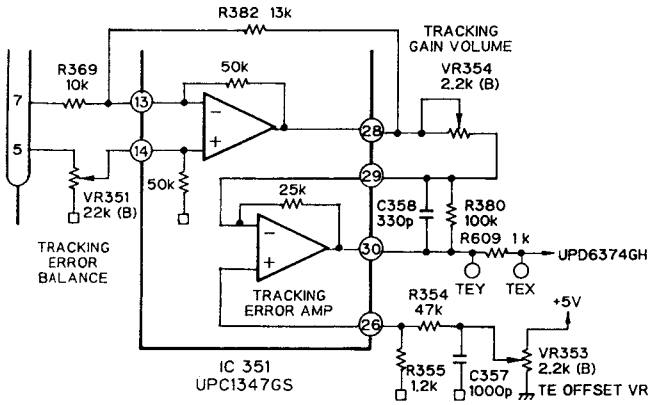
$V_{FE} = 5 \times 25\ k/R_A \times (A + C - B - D)$[REFOUT]

An FE output (Pin ㊱) of about 2.5 (V) is available as an S-shaped curve.



Focus error amplifier Fig. 21

(3) Tracking error amplifier



Tracking error amplifier Fig. 22

The side-spot voltages inputted to E and F are amplified in differential and tracking-error amplifiers so that an output (E-F) can be obtained.

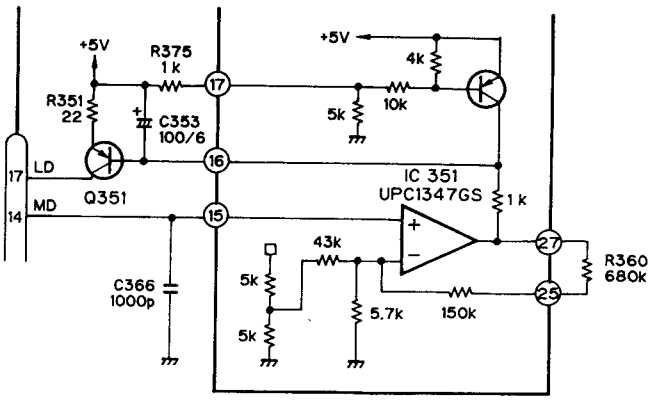
$V_{TE} =$

$50\ k//13\ k\ /10\ k \times 100\ k//25\ k\ /R_B \times (E\text{-}F)$ [REFOUT]

The TE offset VR, moreover, is to cancel a DC offset from the preamplifier to the servo amplifier while the TE balance VR is to adjust the tracking signal symmetry. These are the prerequisites to mainly perform an operation of tracking normally. A tracking error of approximately 2 (v) p-p' is available as an output of pin ㉚.

(4) APC circuit

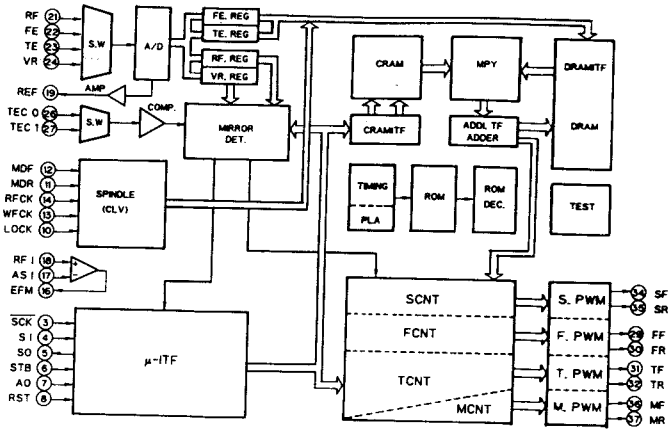
A laser diode, if driven at a constant current, will have a negative temperature curve with a large optical output. It is necessary, therefore, to control the current with a monitor photodiode so that a constant output will be available. This is an APC circuit. The present system has LDI set to approximately 50 thru 60 mA.



APC circuit Fig. 23

2. Servo Stage

This unit has FE, TE and RF outputs received as its inputs from the RF amplifier. And the analog signals are converted to the digital ones, which are in turn used to execute the servo operations of focus tracking, carriage and spindle and the servo control of in-focus track jump, etc. subject to an instruction from the system microcomputer. IC UPD6374AGH (48 pins, flat package) is mainly employed, with the block diagram given in Fig. 24. In addition, this IC has an automatic sequencer built in to perform track jumps, etc; based on the serial data transferred from the system microcomputer. The servo unit is described below on a component by component basis.

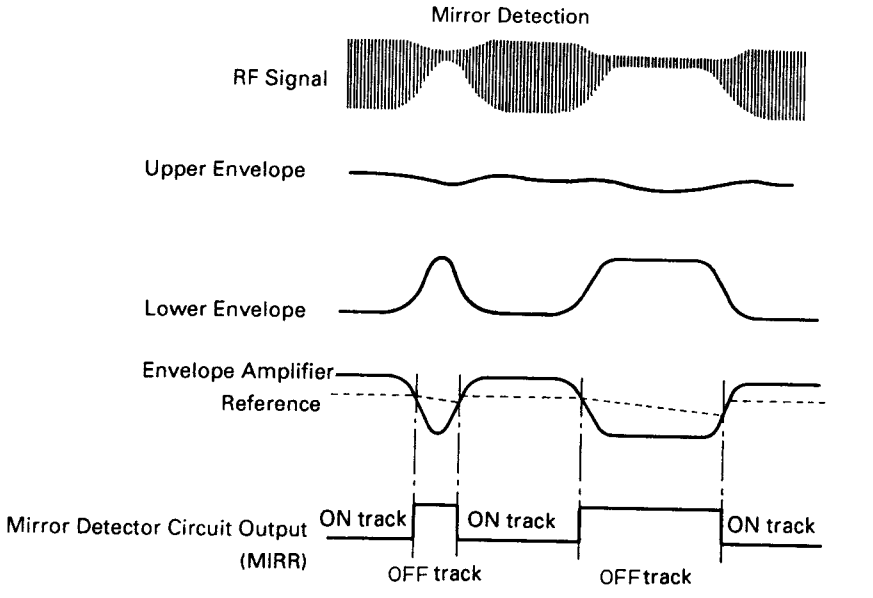


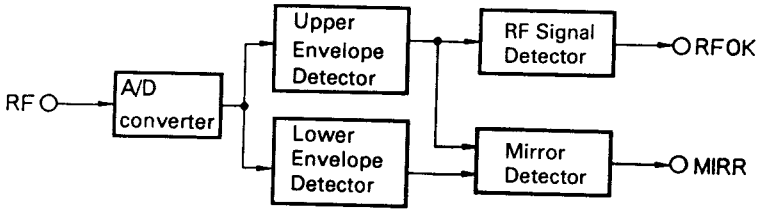
UPD6374AGH Block diagram

Fig. 24

(1) Mirror circuit

The mirror detector circuit is to determine an on-track or off-track status by detecting a mirror status, with an envelope amplitude extracted from an RF signal. For the reference to detect a lack of amplitude, the envelope amplitude is held at the peak with a sufficient large time constant and multiplied by two-thirds to obtain the reference value. Should an RF signal have no amplitude available (with the focus servo removed), the mirror detector circuit has an output (MIRR) go "H."





RF detector / mirror detector circuit block diagram

Mirror circuit

Fig. 25

(2) Focus OK circuit

The FOK circuit compares the upper envelope of an RF signal with the value set by the microcomputer and outputs a result of such comparison at the FOK terminal. ("H" is outputted, with [RF signal's upper envelope] > [set value].)

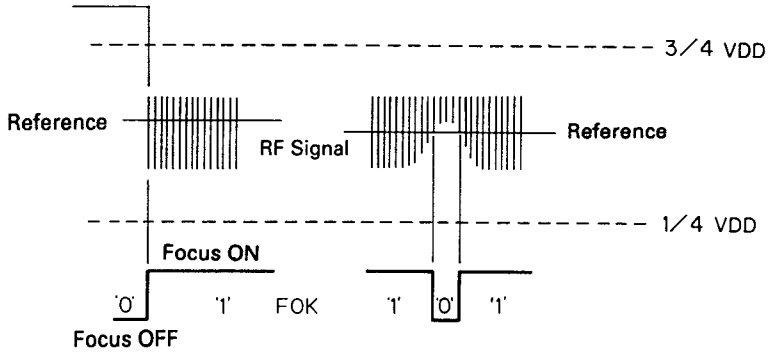
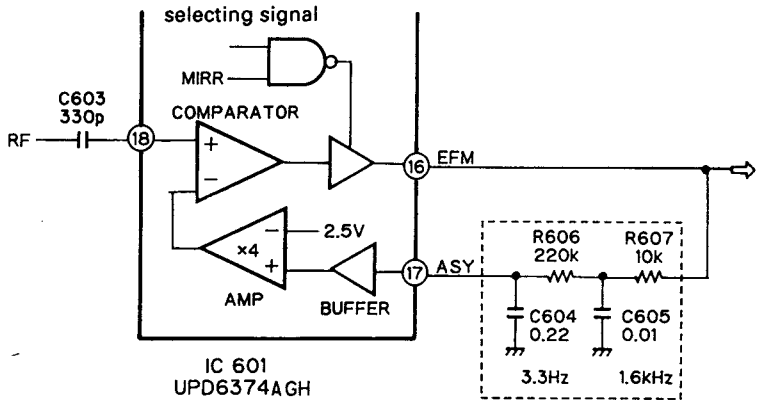


Fig. 26

(3) EFM comparator

The EFM comparator is to digitize an RF signal. Since its error rate increases under the influence of an asymmetry generated, the EFM output signal is made to pass through a low-pass filter by making use of the fact that a bit is generated at a probability of 50 %. And the signal so filtrated is taken for a comparison level. The present system has a low-pass filter cut off fc = 3.3 (Hz) for C604 and R606 and fc = 1.6 (kHz) for C605 and R607.



EFM comparator

Fig. 27

(4) Command code

A list of the commands used in the present system is given below.

10H	SK	TM	TEH	FR	TK	TB	T CNT	BRK
11H	FON	TON	SON	MON	FST	DFCT	JSK	TAB
12H	SLED NON-SENSITIVE AREA				HSL	SCV	RFP	TFP
13H	FOK LEVEL				FSPV 1	FSPV 0	T1	T0
14H	00 (h)							
15H	0	0	0	0	0	TCS	CV2	E3EN
16H	0	0	0	0	FPW	TPW	SPW	MPW

20H	TRACK KICK LEVEL a				
21H	TRACK KICK LEVEL b				
22H	TRACK KICK TIME A				
23H	TRACK KICK TIME B / TRAVERSE COUNTER N (H)				
24H	TRAVERSE COUNTER N (L)				
25H	SLED KICK LEVEL	SL1	SL0	0	0

<Description of Functions>

SK: sled kick control; the sled is kicked at a value set in 25 H, when SK is set to "1."

TM: tracking mute control
With TM = "1," the tracking output is put by TEH into either PRECEDING VALUE HOLD or REFERENCE HOLD (Data 00 value) mode.
With TM "0," a result of tracking and filtration is outputted (in the normal mode).

TEH: error hold control upon track jump
With SK = TM = "1," the tracking output has PRECEDING VALUE HOLD or REFERENCE HOLD mode selected.
REFERENCE HOLD, with TEH = "0" and PRECEDING VALUE HOLD, with TEH = "1"

FR: output level polarity control upon tracking and upon sled kicking
With FR = "0," a value available at output level registers (20,21 and 25 H) is multiplied by -1 and outputted.
With FR = "1," an output level register is outputted unchangedly.

TK: controlling both track jump trigger and traverse counter load; it has two meanings according to the T. CNT bit.
With T.CNT = "0," set the TK bit to "1" and the track jump sequencer will start.
With T.CNT = "1," set the TK bit to "1" and the traverse counter will be loaded with Values 23 H and 24 H.

BRK: half-wave brake circuit control
With BRC = "1," the half-wave brake is ON.

TB: selecting a tracking filter coefficient bank:
With TB = "0," the tracking filter bank goes 0.
With TB = "1," the tracking filter bank goes 1.
FON, TON, SON and MON: servo output (PWM output) on/off control
With any = "1," the PWM output is on.
With any = "0," the PWM output has stopped.
With PWM output stopped, a high impedance is outputted with the PWM in the single-phase 3-value output mode.

FST: focus search control
With FST = "1," a focus search will be started if FON = 1.

DFCT: tracking output hold control with flaw detected
With DFCT = "1," the tracking hold is outputted upon detection of flaw.

JSK: sled kick control upon jump
With JSK = "1," the sled is kicked at a level set in 25 H for a duration of the track jump.

TAB: track jump sequencer operation abort control
With TAB = "1," the track jump sequencer stops operating.
SLED NON-SENSITIVE AREA: A sled dead zone is controlled at an absolute vale of 4 bits.

HSL: selecting the tracking output hold control
With HSL = "0," the tracking output hold is controlled by a missing FOK signal.
With HSL = "1," the tracking output hold is controlled by means of an external hold.

SCV: selecting a sled servo control with CLV lock
With SCV = "0," the sled servo is turned off (with PWM output stopped) to unlock CLV.
With SCV = "1," the sled servo is normally on, irrespective of whether or not CLV is locked.

RFP: selecting the polarity of data to an RF processor system (circuits to generate FOK, MIRR, etc.)

TFP: selecting the polarity of a tracking error zero cross (TEC) signal

FOK LEVEL:
setting a reference value in the RF detector circuit

FSPW1, FSPW0:
selecting a PWM output carrier

FSPW0: changing a motor system PWM carrier 88.2 kHz with FSPW0 = "0" and 22.05 kHz with FSPW0 = "1."

FSPW1: changing an actuator system PWM carrier 88.2 kHz with FSPW1 = "0" and 176.4 kHz with FSPW1 = "1."

T1, T0: square wave cycle upon focus search

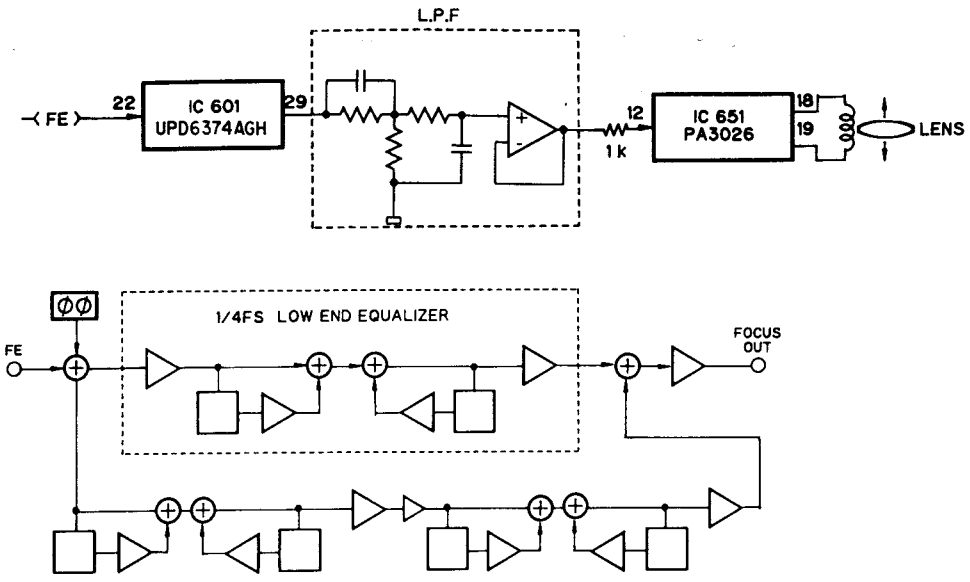
SETTING		CYCLE
T0	T1	
0	0	approx. 0.74 sec. (2^{16}/Fs)
0	1	approx. 1.49 sec. (2^{17}/Fs)
1	0	approx. 2.97 sec. (2^{18}/Fs)
1	1	approx. 5.94 sec. (2^{19}/Fs)

20 H, 21 H:
register to set a kick level upon track jump
22 H, 23 H:
register to set a kick time upon track jump
Kick Time = (set value + 1) × 1/Fs (11.3 µs)
23H, 24H:
traverse counter setting register
25H: sled kick setting register
SLED KIK LEVEL:
sled kick level setting register
SL1, SL0:
selecting SLED FULL KICK or SHORT mode

SL1	SL0	MODE
0	1	short
1	0	full kick
0	0	normal kick

TCS: selecting the tracking zero cross comparator
TECO input, with TCS = "0" and
TEC1 input, with TCS = "1"
CV2: selecting the sensitivity of CLV error detector with speed doubled
Normal speed selected, with CV2 = "0" and
Double speed selected, with CV2 = "1"
E3EN: controlling the function of protecting EFM ≦ 3T upon high-speed access
protector off, with E3EN = "0" and Protector on, with E3EN = "1."

(5) Focus servo system



FOCUS SIGNAL FLOW
(IC601)

Fig. 28

The digital loop filter is built in the interior of the IC. Sending a coefficient from the microcomputer will allow you to obtain a desired equalizer curve. The present system has an equalizer curve shown in Fig. 32.

a) In-focus
In the in-focus sequence, the lens is driven into a focus S-curve (approx. 10 µm) to close the servo loop on an in-focus basis. A flow of signals in focus is shown in Fig. 29.

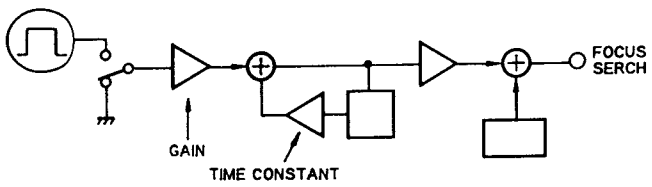


Fig. 29

The search voltage is designed to fall within a range of the lens drive distance ± 1.0 mm, being entirely dependent upon the sensitivity of a focus actuator. In the present system, both gain (voltage) and time constant are determined according to a coefficient from the microcomputer, based on the pulse in a specified cycle, which has been set in a register. The timing in which a focus is to be closed, moreover, is generated, based on the value which has been set as referred to in a signal flow shown in Fig. 30.

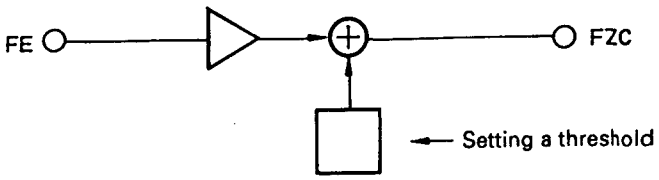


Fig. 30

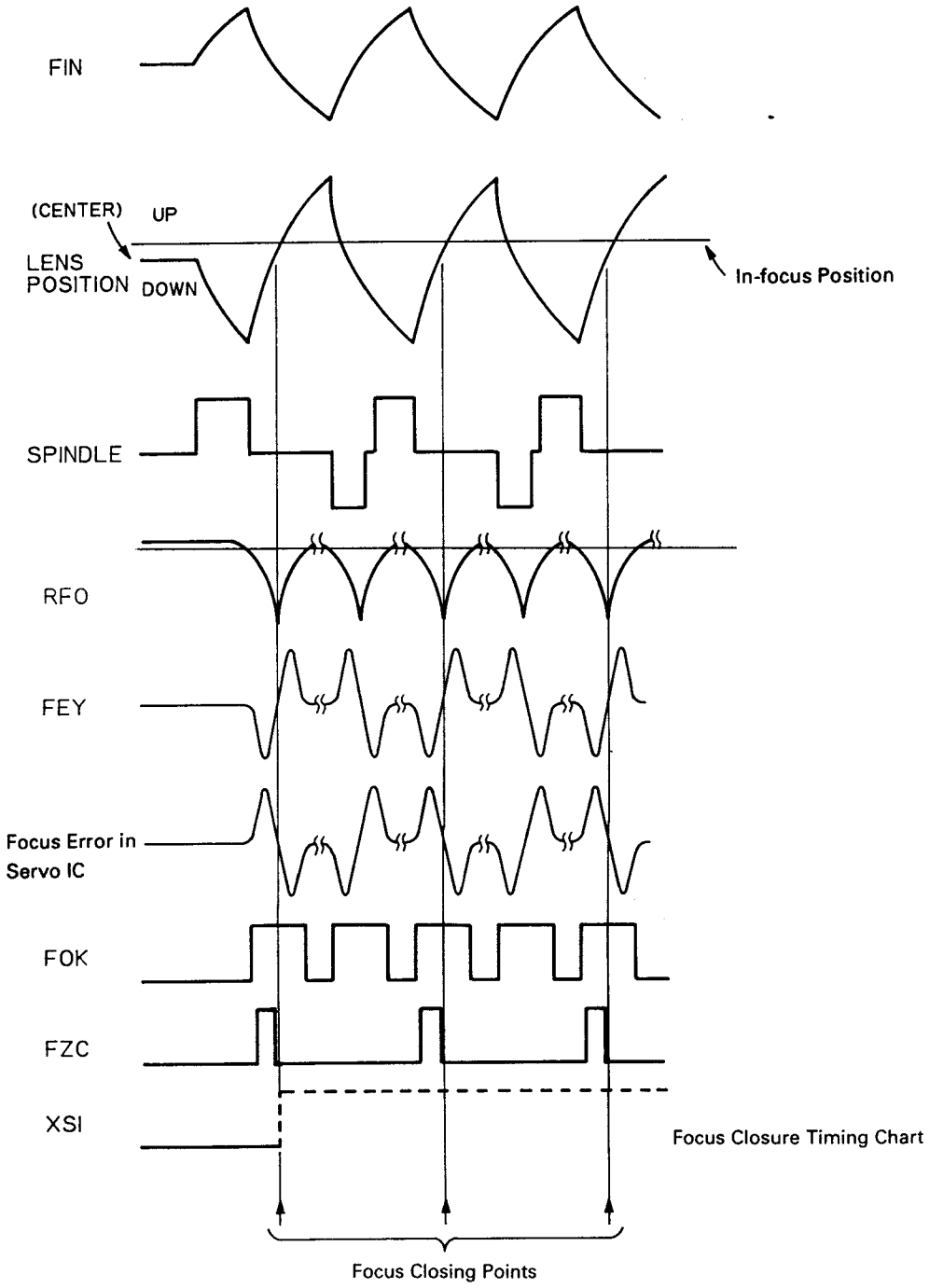
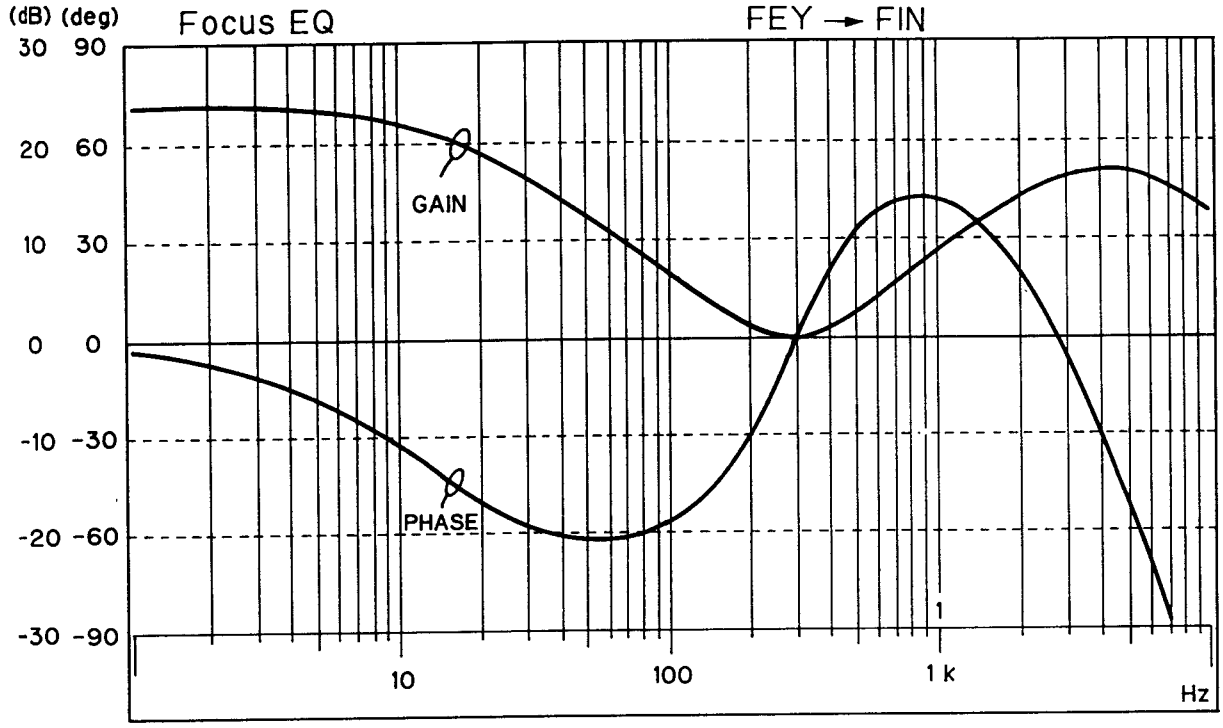

FIN
(CENTER)
UP
LENS POSITION
DOWN
In-focus Position
SPINDLE
RFO
FEY
Focus Error in Servo IC
FOK
FZC
XSI
Focus Closure Timing Chart
Focus Closing Points

Fig. 31

(6) Focus equalizer

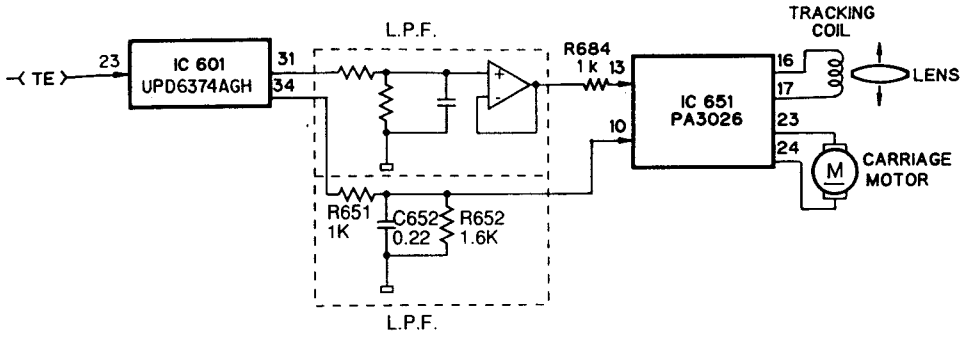
The present system permits a specific equalizer curve to be obtained according to the coefficient sent from the microcomputer. A digital filter built in IC UPD6374AGH and an active filter mounted in the exterior are used to obtain a specified equalizer curve.



Focus equalizer (Example)

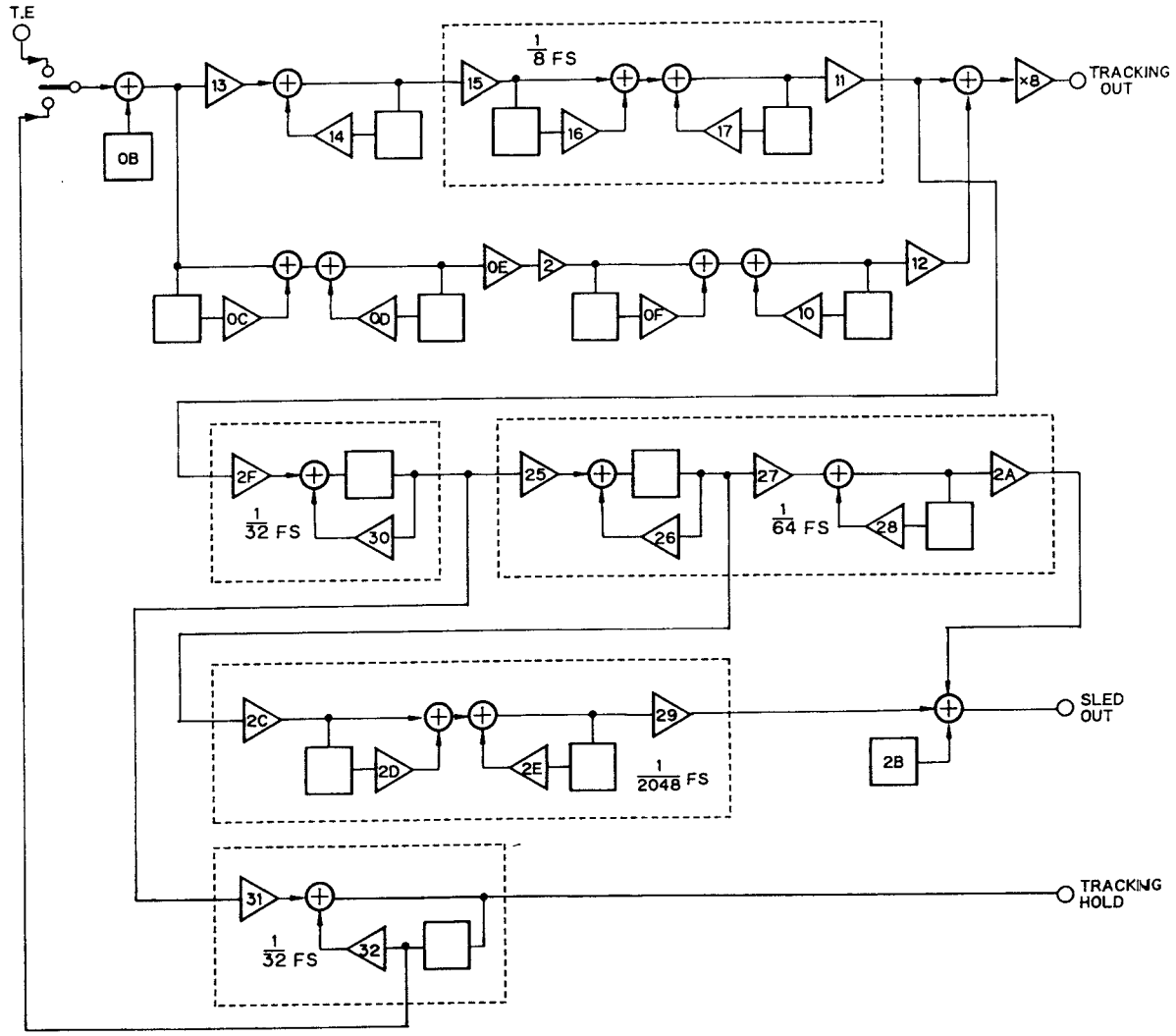
Fig. 32

(7) Tracking carriage servo system



Tracking carriage servo block diagram

Fig. 33



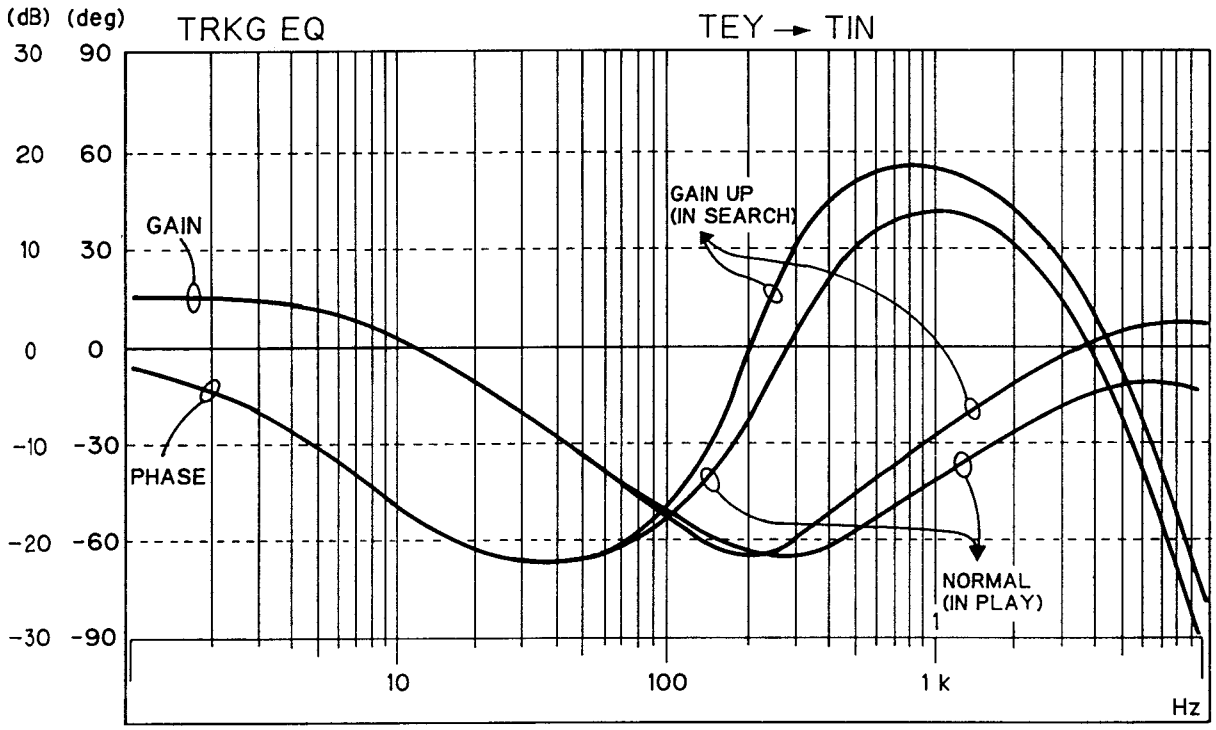
Tracking carriage signal flow chart
(IC601)

Fig. 34

Shown in Fig. 33, 34 are a block diagram of the tracking carriage servo system and a flow of signals in IC UPD6374AGH. To make a track jump either forward or reverse, tracking kick and brake voltages and carriage kick and brake voltages are set in related registers beforehand. A jump forward or reverse is made at the voltage which has been set in an instruction from the microcomputer.

a) Traking equalizer

In the present system, a digital filter is built in IC UPD6374AGH, allowing a specific equalizer curve to be obtained according to the coefficient sent from the microcomputer. And a passive filter is externally mounted. These two filters are used to obtain a specified equalizer curve. To allow a stable pull-in throughout the search, moreover, the equalizer curve applied is so set as to obtain a higher level of gain than that during the play.
Fig. 35 shows the tracking equalizer curves observed during both play and search.

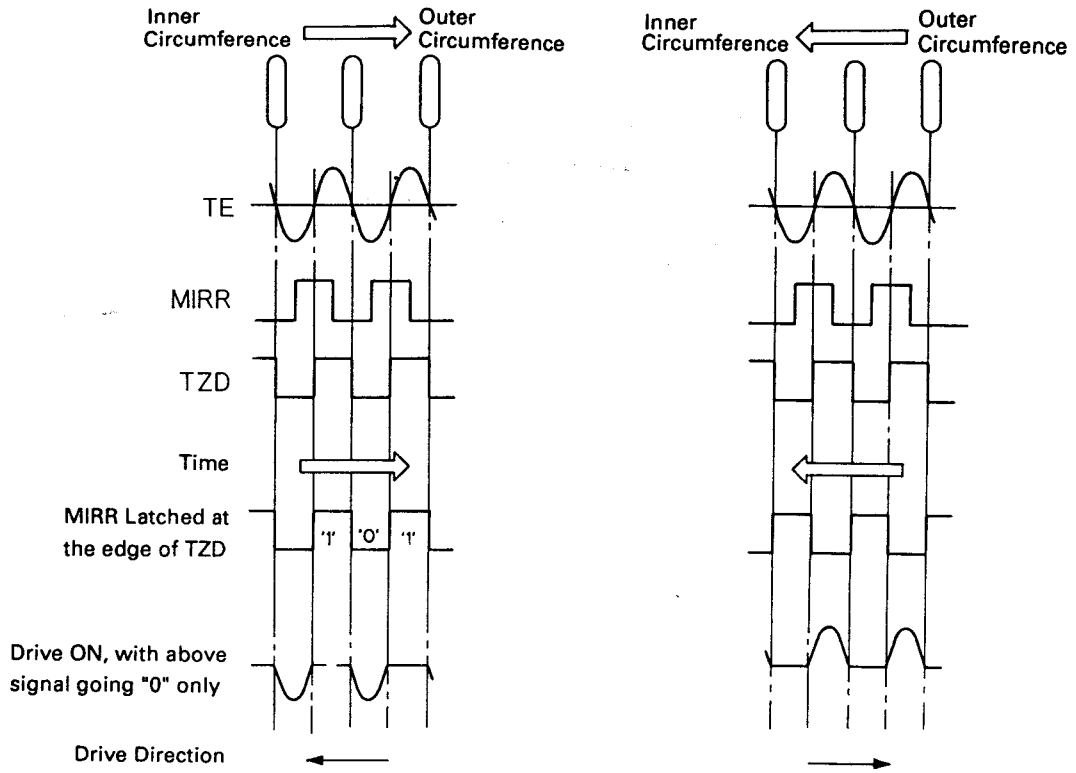


Tracking equalizer (Example)

Fig. 35

b) Brake Circuit (Fig. 36)

Since the actuator is put into a non-linear status in the in-focus mode or in the track-jump mode, the pull in the servo loop turns out very poor after completion of a jump. While both pickup and disc are relatively moving, the brake circuit permits tracking to be closed smoothly. The direction in which both pickup and disc are moving is detected, based on a phase relation between MIRR and tracking error signals. With an accelerating component only cut off the tracking error, the decelerating component only is used while repeating the ON/OFF operations of servo on a chopper basis.
Thus, a stable pull in the servo loop is performed.
This circuit's ON/OFF operations are controlled by the microcomputer.

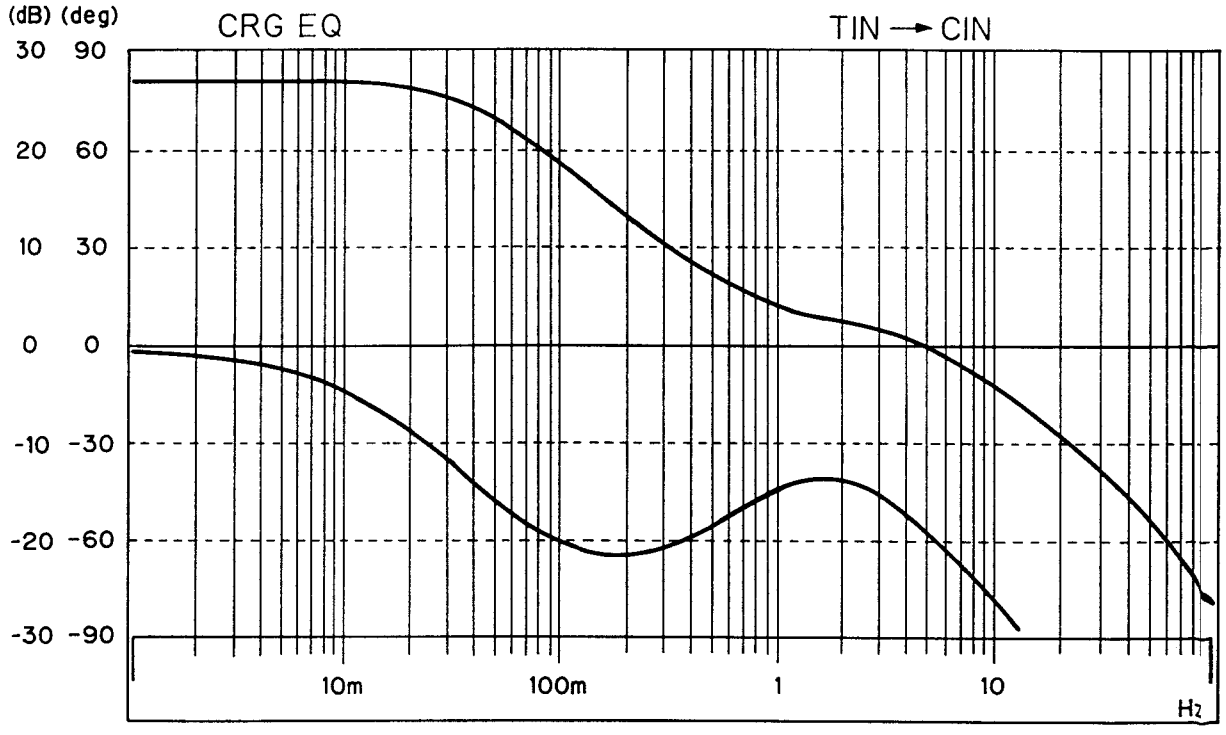


Brake circuit operation

Fig. 36

c) Carriage equalizer

As shown in the signal flow, the carriage servo system takes for an input the voltage at which the tracking actuator is driven. Based on the equalizer curves shown in Fig. 37, moreover, the system obtains those components which are required to feed the carriage. In the present system, a threshold voltage is set beforehand so as to turn on the carriage servo when the tracking actuator has a lens deflection fall outside the range of approximately±30 tracks in relation to the low-pass filter output at the tracking drive voltage.

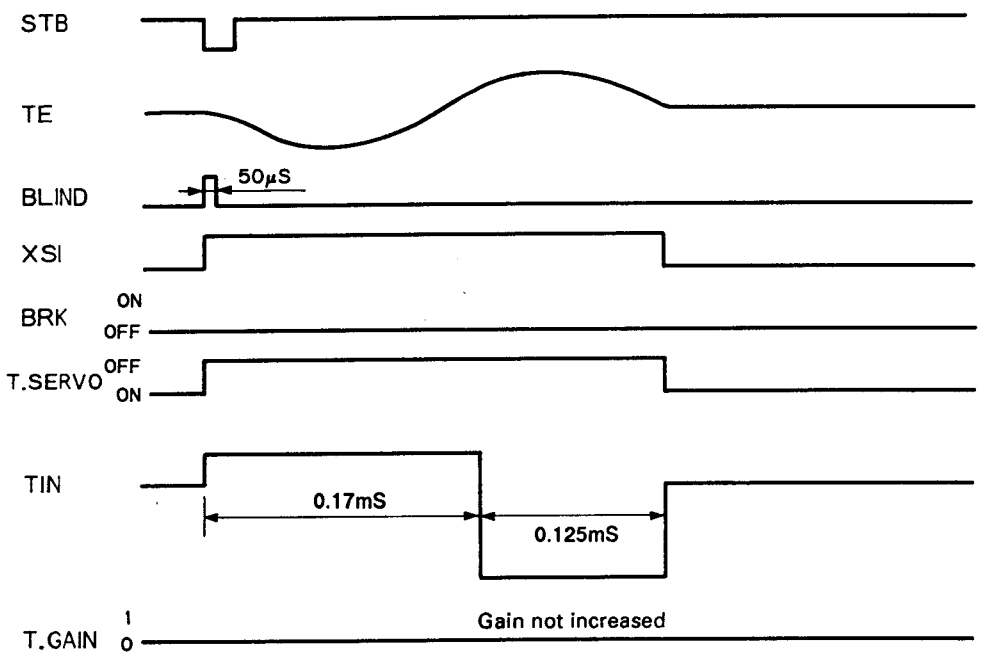


Carriage equalizer (Example)

Fig. 37

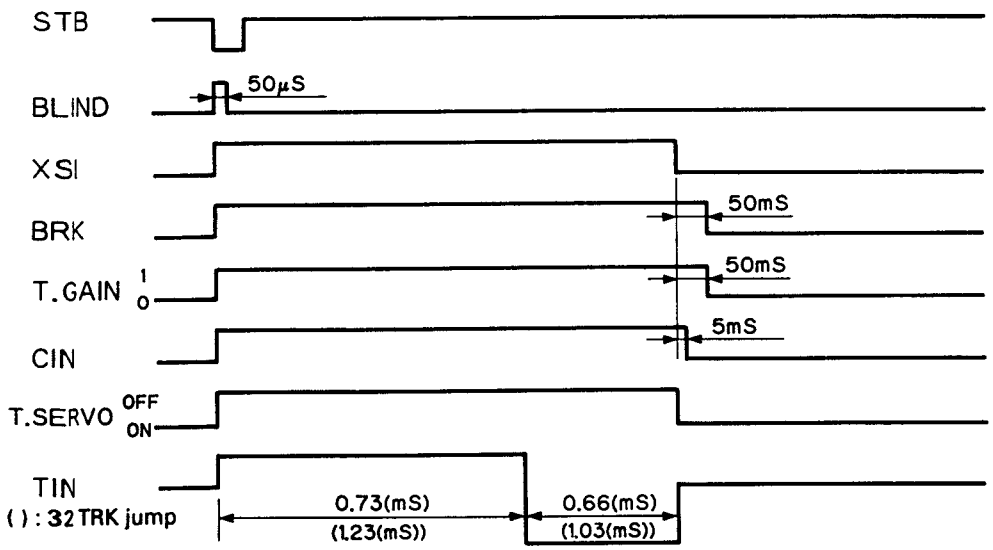
(8) Track Jump

The present system is jumping tracks 1, 10 and 32 subject to an automatic sequence of the UPD6374AGH.
The 64, 80 track jumps conventionally available have been substituted for 32TRK × 2 and 32TRK × 3, accordingly.Fig. 38, 39 shows a timing chart of the 1, 10 and 32 track jumps.



Single jump

Fig. 38

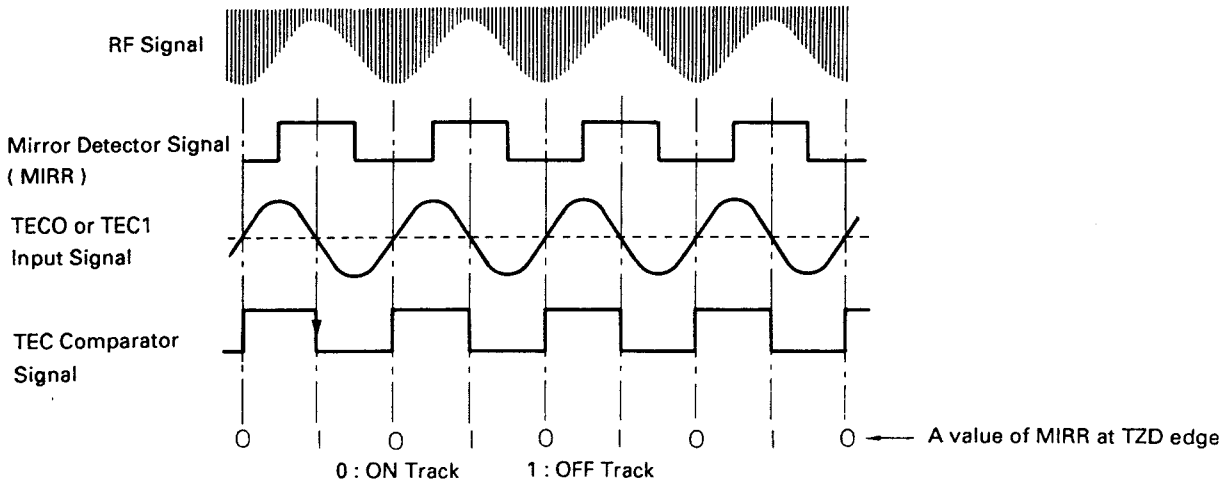


10/32 Track jump

Fig. 39

a) Track jump counter

When tracks are consecutively crossed, a tracking error signal will not fail to cross the DC offset point in both on- and off-track modes as shown in Fig. 40. This point, threrfore, is used to determine either on- or off-track so as to count the number of cycles in which the on-track is switched over to the off-track. A count value is set by the microcomputer. And this count value is given priority to the kick-setting time.


RF Signal
Mirror Detector Signal
(MIRR)
TECO or TEC1
Input Signal
TEC Comparator
Signal
0 0 0 0 0
A value of MIRR at TZD edge
0 : ON Track
1 : OFF Track
The number or cycles in which 0 changes to 1 should be counted.

Track count jump

Fig. 40

3. CLV Control Stage

(1) CLV control command and CLV mode command

MSB LSB

D	I	L	G	T	D2	D1	D0

D	0	RFCK/4 and WFCK/4	Select a steady servo phase comparison signal.
	1	RFCK/8 and WFCK/8	
I	0	RFCK/16	Select a bottom hold cycle of pull-in and rough servos.
	1	RFCK/32	
L	0	MDF, MDR (H, Z) outputs	Select an MDF/MDR output terminal selecting method.
	1	MDF, MDR (H, L) outputs	
G	0	−12 dB	Select the gain of pull-in and rough servos.
	1	0 dB	
T	0	RFCK/2	Select a peak hold cycle of pull-in servo.
	1	RFCK/4	

D2	D1	D0	MDF	MDR	Control Status
0	0	0	L	L	stop
0	0	1	H	L	kick
0	1	0	L	H	brake
0	1	1	L	L	stop
1	0	0	L/H	L/H	pull-in servo
1	0	1	L/H	L/H	rough servo
1	1	0	L/H	L/H	steady servo
1	1	1	L/H	L/H	applied servo

• Pull-in Servo

This servo is used to pull the spindle motor speed into a specified number of revolutions. With a cycle of 8.6436 MHz reckoned as T, we can get "22T" (synchronous signal) as the maximum inversion interval of an EFM signal at the specified number of revolutions. Therefore, determine the EFM signal's maximum inversion interval and compare it with "22T" so that we can detect whether the motor speed is higher or lower than the specified number of revolution.

EFM SIGNAL MAX. INVERSION INTERVAL	MDF TERMINAL	MDR TERMINAL	MOTOR SPEED
"21T" and below	L(Z)	H	high
"22T"	L(Z)	L(Z)	
"23T" and above	H	L(Z)	low

Z: High impidamce

• Rough Servo

This servo is used for the high-speed access in which the carriage is moved at a high speed, with focus servo ON and tracking servo OFF.

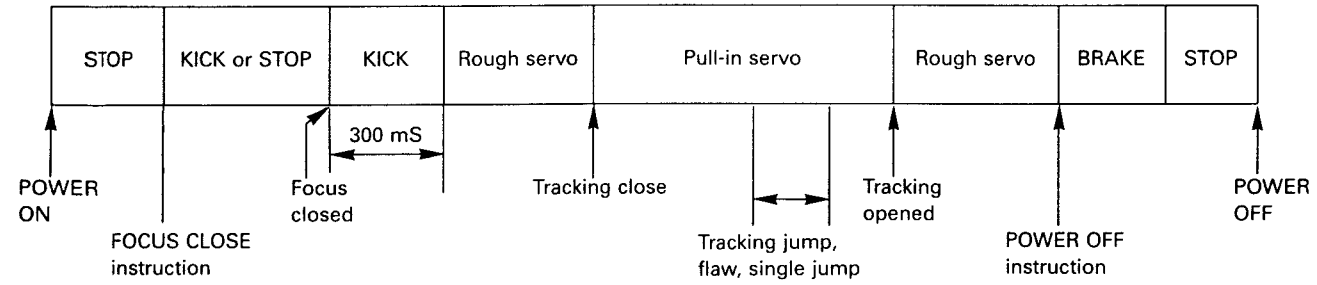
• Steady Servo

This servo is used to maintain the spindle motor speed at a specified number of revolutions.
It is outputted as a result of comparing the phase between WFCK/4 and RFCK/4 or between WFCK/8 and RFCK/8.

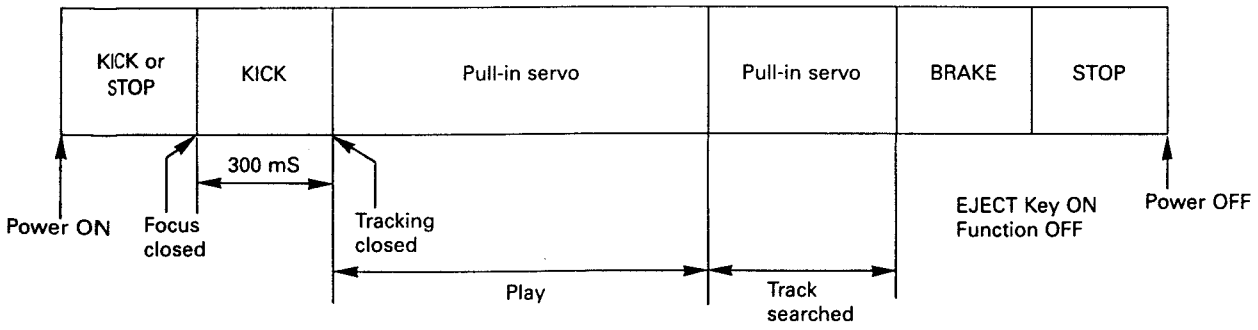
• Application Servo

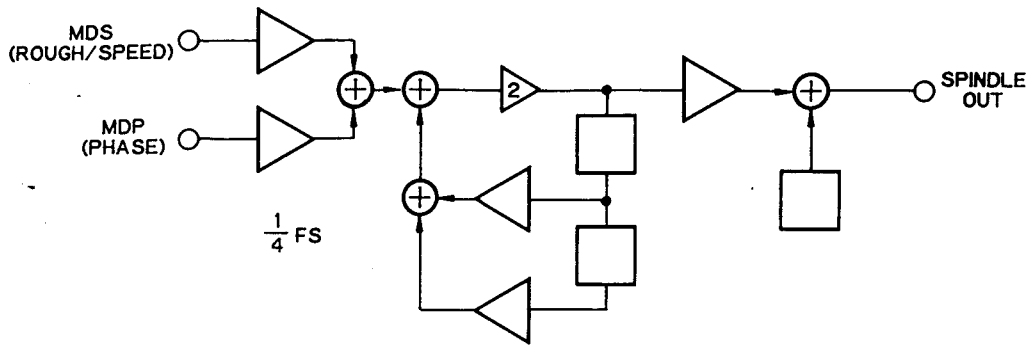
This is the CLV servo mode available during the normal operation. In the EFM demodulator block, every WFCK/16 is sampled to determine whether or not the frame synchronizing signal coincides with an output of the internal frame counter. As a result, a signal is generated to show whether or not they are coincident. Once this signal has been found not incident in eight consecutive cycles, the status is first determined asynchronous. Under any other conditions, the status is deemed synchronous. The CLV application servo mode automatically selects the pull-in servo in the asynchronous status and the steady servo in the synchronous status. This feature is not employed in the present system.

• Test Mode



• Normal Mode



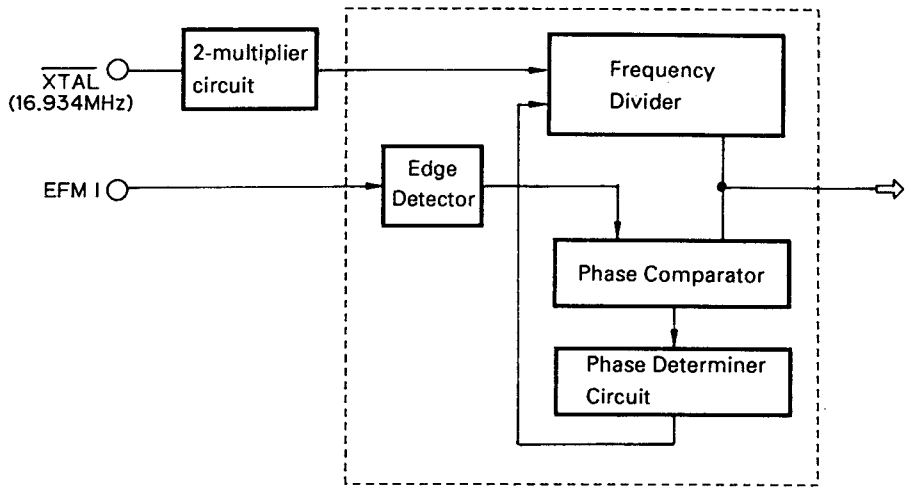


Spindle signal flow chart
(IC601)

Fig. 41

(2) PLL stage

The present system employs a digital PLL circuit illustrated below. This PLL circuit operates so as to lock the rising edge of a PLCK and the edge of an EFM signal. And it has a resolution of as high as approximately eight times IT (T = EFM signal's bit rate = 1/4.3218 MHz). Both frequency divider output frequency and EFM bit rate have their errors automatically regulated to adjust the mean free-run frequency to the bit rate.



Digital PLL block diagram
(IC701)

Fig. 42

4. Power Supply Stage

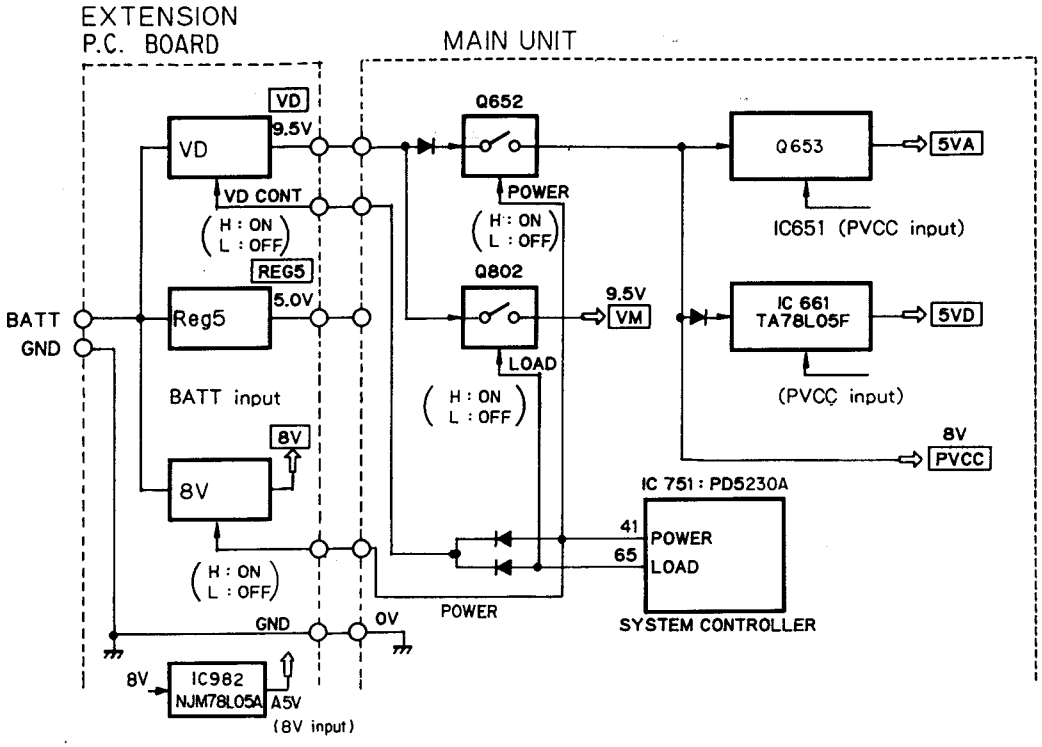


Fig. 43

The −5V power in the main unit is available in two types; 5VA and 5VD. The 5VA is used to supply power to the pickup LD and to the preamplifier system and the 5VD to other LSIs.
The VM is used to supply power to the mechanism-driver IC (IC801). No output is available as long as mechanisms are operating.

The REG5 is used to supply power to the system controller (IC751 and 755) while outputting normally.
The 8V is used for the auto system circuit (amplifier and isolator) in the extended unit and not supplied to the main unit. From this 8V, IC982 generates the power supply (A5V) to the D/A converter in the extension unit.
It should be noted that the Q973 in the VD circuit has a very high temperature.

5. New Test Mode (FH-M70+CDX-M12)

The new test mode performs more or less the same operations as the normal mode PLAY, but is able to carry out a more detailed analysis of error stop causes. During setup, it displays the operation status of the CD control software. After setup, it displays the causes, time of occurrence, and disc number of protection operations, errors, and time-out of FOK, LOCK, sub-code readability and un-readability, sound dropping, mechanism error, etc.
The following new test mode keys are examples when combined with FH-M70.

• New Test Mode (aging operation and setup analysis)

The CD, either single or multiple, plays in the normal mode. After being set up, it will display FOK (focus), LOCK (spindle), subcode, sound skip, protection against a mechanical error or the like, occurrence of an error, cause and time of an expiry, if any, (and disc number in the multi-mode).
During the setup, the CD software operation status (internal RAM and C-point) is displayed.
Since it is nesessary to cope with the error number display function.

(1) How to Put in the NEW TEST Mode
See the test mode flow chart Page 8.

(2) Relations of keys between TEST and NEW TEST Modes.

P-BUS Commands	Keys	Test Mode Regulator OFF	Regulator ON	New Test Mode Play in progress	New Test Mode Error / Protection } Talking place
B0	BAND/REL	Regulator ON	Regulator OFF	BAND/REL	Time of occurrence / Cause of error } Selected
B1	►►I	—	FWD-KICK	►►I	—
B2	I◄◄	—	REV-KICK	I◄◄	—
B3	F · 1	—	TRACKING CLOSE	F · 1	—
B4	F · 4	—	TRACKING OPEN	F · 4	—
B5	F · 2	—	FOCUS CLOSE	F · 2	—
B6	—	—	FOCUS OPEN	—	—
B7	—	—	Jump-OFF	—	—
B8	F · 3	To new Test Mode	Jump-Mode selected	F · 3	Occurrence TNo / Time of occurrence } Selected

Operations, such as EJECT, CD ON/OFF, etc. are to be performed normally

(3) Error Cause (Error Number) Code

Error Code	Classification	Mode	Description	Cause/Detail
40	ELECTRIC	PLAY	FOK — L 100 ms	Put out of focus
41	↑	↑	LOCK — L 150 ms	Spindle unlocked
42	↑	↑	Subcode unacceptable 500 ms	Subcode failes to read
43	↑	↑	Sound skipped	Last address memory operated

Scar, Stain, Vibration, Servo defect, etc...

*With CD single, no mechanical error is displayed while aging. The error code is identical with those in the normal mode.

(4) Indicating an Operation Status During Setup

Status No.	Description	Protection operation
01	Carriage home mode started	None
02	Carriage moving on the internal circumference	10-second time out
03	Carriage moving on the external circumference	10-second time out
11	Setup started	None
12	Spindle turn/Focus search started	None
13	Waiting for focus closing	Failure to focus closing
14	Spindle kicked and focus checked	Out of focus
15	Tracking closed and focus checked	Out of focus
17	Carriage closed and focus checked	Out of focus
18	Lock, subcode } Waiting	Failure to lock, Subcode failed to read out of focus
19	End	None

(5) Example of 7-segment Display

(a) SET UP in progress

TRACK	MIN	SEC
11	11	11
TRACK		
11		
MIN	SEC	
11	11	

While in the TEST MODE, a status number is indicated in TNO, MIN and SEC.

(b) Operation (PLAY, SEARCH, etc.) in progress Perfectly identical with that in the multi mode.

(c) Protection/Error upon occurrence

ERROR-XX Err-XX, ERR-XX E-XX	While in the error mode, an error number is displayed in MIN and SEC.

Select the display with the BAND/REL key.

TRACK	MIN	SEC	
10	40	05	While in the PLAY MODE, an adsolute time is indicated in TNO, MIN and SEC.
TRACK			
10			
MIN	SEC	}	Select the display with the F · 3 key.
40	05	}	

15. OPERATIONS AND CONNECTION

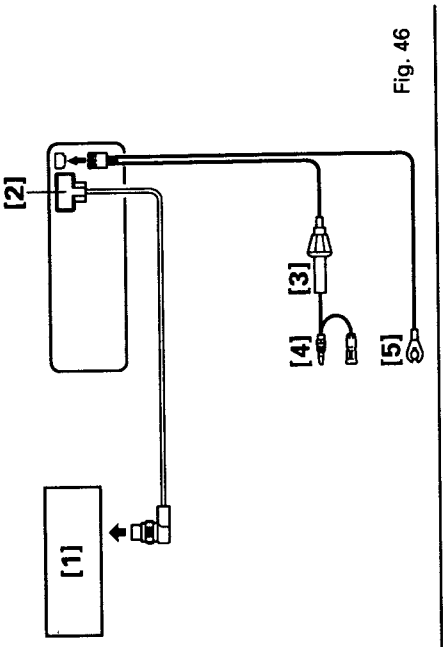


Fig. 46

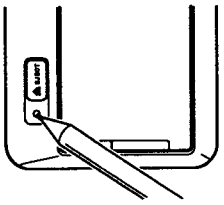


Fig. 45

Pressing the clear button

If the power does not switch on or if the compact disc player does not operate when the button on the multi-CD controller is pressed, or if the multi-CD controller display is incorrect, press this button on the player with the tip of a pencil to restore normal operation. **Always press the clear button on the multi-CD controller, too, after pressing this button.**

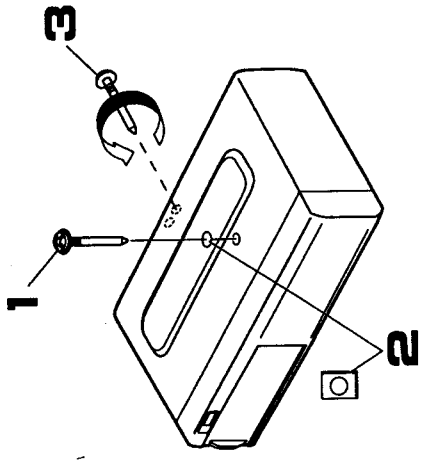
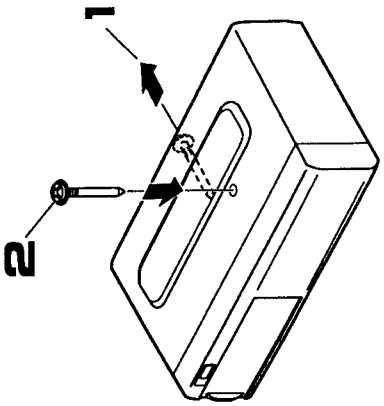


Fig. 44



Transportation pin

Removing the transportation pin (Fig. 44)

A transportation pin is installed to protect the player during transportation. Before mounting the player, remove the transportation pin and cover the hole with the supplied adhesive seal. Screw the removed transportation pin into the specified hole; it will be needed if you retransport the player.

1. Peel off adhesive tape and remove the pin.
2. Cover the hole with the seal provided.
3. Screw the pin into the left-side hole of the 2 holes.

Reinstalling the pin (Fig. 45)

To transport the player, reinstall the transportation pin as follows:

Before removing the player

Play back the first track of a disc, and stop within 10 seconds. Remove the magazine, wait about 10 seconds, then remove the player.

1. Remove the pin.
2. Insert the pin in its original position, and fix it with Scotch tape.

Connecting the Units

- Before mounting, remove the transportation pin and connect the units temporarily. Check that the units are connected correctly by operating the multi-CD controller.
- After connection is complete, press the clear buttons on the player and the multi-CD controller with the tip of a pencil.
- *Be sure to connect the ground lead (black) to the vehicle body or some other metal part that is properly grounded to the chassis. If the ground lead is not properly connected, noise may occur or the player or multi-CD controller may not operate correctly.*
- *This unit is for vehicles with a 12-volt battery and negative grounding. Before installing it in a recreational vehicle, truck, or bus, check the battery voltage.*
- *To avoid shorts in the electrical system, be sure to disconnect the battery ⊖ cable before beginning installation.*
- *Check whether installation and wiring have been completed correctly. Replace the removed car components, then connect the end of the cable to the negative ⊖ terminal of the battery.*
- *Secure the wiring with cable clamps or adhesive tape. To protect the wiring, wrap adhesive tape around them where they lie against metal parts.*
- *Route and secure all wiring so it cannot touch any moving parts, such as the gear shift, handbrake, and seat rails. Do not route wiring in places that get hot, such as near the heater outlet. If the insulation of the wiring melts or gets torn, there is a danger of the wiring short-circuiting to the vehicle body.*
- *Don't pass the orange lead through a hole into the engine compartment to connect to the battery. This will damage the lead insulation and cause a very dangerous short.*
- *Do not shorten any leads. If you do, the protection circuit may fail to work when it should.*
- *Never feed power to other equipment by cutting the insulation of the power supply lead of the unit and tapping into the lead. The current capacity of the lead will be exceeded, causing over heating.*
- *Replace fuses only with the types stipulated on the fuse holder.*

(Fig. 46)

[1] Multi-CD controller
[2] Insert the 13-pin connector cord plug into the socket of the set.
[3] Fuse holder
[4] Orange
To terminal always supplied with power regardless of ignition switch position.
[5] Black (ground)
To vehicle (metal) body.

Using the Compact Disc Magazine

Precautions when handling magazines

- *Do not put the magazine in a place where it will be exposed to high temperatures or direct sunlight.*
- *Do not disassemble the magazine.*
- *Take care not to drop the magazine or knock it against anything.*
- *Do not use cracked or warped trays.*
- *Never insert anything other than discs. Do not attach a label or tape to a disc.*
- *The use of benzine, thinner, insecticide, or other volatile chemicals may damage the magazine surface.*

Extra magazines

If you need more magazines, please ask your nearest dealer for magazine JD-T1212.

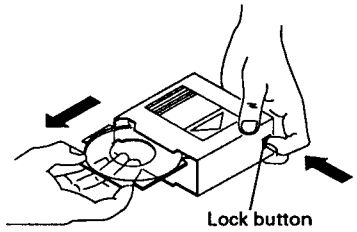
Notes on 8-cm CDs

- *Do not use an 8-cm CD adapter. If it is used, the player may fail. To load an 8-cm CD, you need a special 8-cm CD tray (Part No. CXA5485).*

Inserting discs

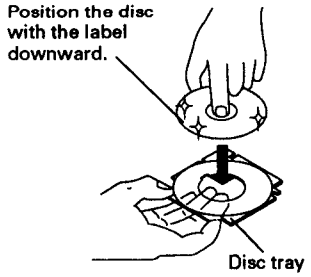
Load the discs in the magazine supplied.
Up to 12 discs can be loaded in the magazine. The discs are numbered 1 to 12 from the bottom disc tray.

1. Hold down the magazine lock button and, pull the tray out.



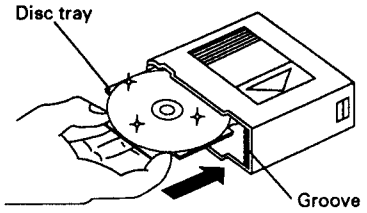
- *Pull the tray out by holding it from underneath as shown in the figure. The tray is detached from the magazine. Do not drop the tray or disc and so damage it.*

2. Put 1 disc on the disc tray, label downward.



- If the disc is loaded upside down, it will not play. The label side must face downward.
- Do not touch the recorded side of a disc when inserting or removing it.

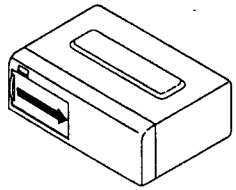
3.Insert the tray horizontally along the right and left grooves of the magazine until it clicks. (The disc must not lift from the tray.)



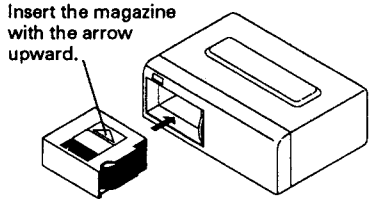
- *If the tray is not aligned with the right and left grooves, it cannot be pushed to the end. Do not bend or force the tray.*
- *Always load 12 trays in a magazine to prevent loss or warping of trays.*
- This compact disc player recognizes which magazine is in use from the bottom disc. Always keep a disc in the bottom disc tray.
- If you load a disc with the label generally printed in black facing up, not only will the player not be able to recognize whether the disc is set or not, but also, if you have a multi-CD controller, the controller will not display an error message to let you know about it. So make sure all the discs in each magazine have their label sides facing down.

Loading and removing the magazine

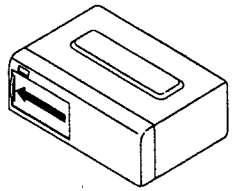
1.Slide and open the door.
Open it fully until it locks with a click.



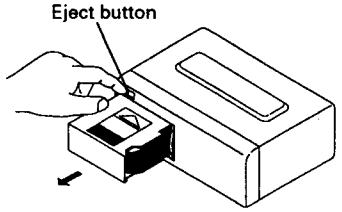
2.Insert the magazine.
- Make sure that the magazine is loaded with discs before inserting it into the player.
- Be careful to insert the magazine into player with the mark facing upward.
- *If the label on the magazine is coming off or wrinkled up, it may damage the eject mechanism, and in some cases, the magazine may not be ejected. Therefore, remove a damaged label completely before use.*



3.Slide and close the door.
- *Never leave the door open while playing discs. The entry of dirt, dust, or any other foreign matter into the player may cause it to fail.*



4.To remove the magazine, open the door and press the eject button. If the door is not fully open, the magazine will not be ejected.



How to use the multi-CD player

How to use the multi-CD player is explained in the instruction manual supplied with the multi-CD controller. The operation method of this player is not described in the owner's manual for some models, or it may be different from the description. See the following items.

Selecting discs

The following multi-CD controller owner's manual describes the operation of the 6-disc multi-CD player (CDX-M30, etc.), so selection of discs 7 to 12 is not explained there. If you use this player with the following multi-CD controller, read the following description of operation.

KEH-M8500	KEH-M780
KEH-M7550	KEH-M7500
KEH-M6500	KEH-M680
DEH-M990DSP	

KEH-M9500RDS	KEH-M8500RDS
KEH-M8000RDS	KEH-M6500SDK
KEH-M6500	DEH-M990RDS

Disc selection (disc number search)

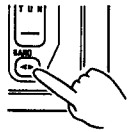
- The operation is described taking the KEH-M8500 as an example. It also applies to other models.
- The operation is described taking the KEH-M9500RDS as an example. It also applies to other models.

Operation from the main unit

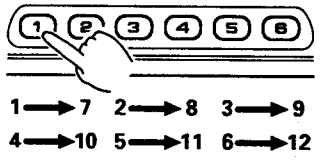
To select one of discs 1 to 6:
Press the button corresponding to the desired disc number.

To select one of discs 7 to 12:

1. Press the program clear button until "7–12" flashes on the display (for about 8 seconds) while playing discs 1 to 6.



2. When "7–12" is flashing on the display, buttons 1 to 6 can be used to select discs 7 to 12. Press the button corresponding to the desired disc number. (Example: To play the disc in tray 7, press button 1.)



- To select discs 1 to 6 while discs 7 to 12 are being played, press the program clear button until "1–6" flashes on the display. When "1–6" is flashing on the display, buttons 1 to 6 can be used to select discs 1 to 6. Press the button corresponding to the desired disc number.

Remote controller operation

Each time the button is pressed, the disc number changes from 1 to 12.

Old models of multi-CD controllers other than those shown above (KEH-M8500, etc.)
- Models for which the operation method of 12-disc multi-CD players is not explained in the owner's manual of the multi-CD controllers

Old models of multi-CD controllers other than those shown above (KEH-M9500RDS, etc.)
- Models for which the operation method of 12-disc multi-CD players is not explained in the owner's manual of the multi-CD controllers

Disc selection (disc number search)

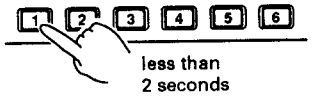
- The operation is described taking the KEX-M850 as an example. It also applies to other models.
- The operation is described taking the KEX-M830RDS as an example. It also applies to other models.

Disc number display

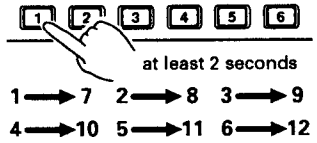
- The disc number shown on the display is 1–6 regardless of whether discs 1 to 6 or 7 to 12 are selected. (Discs 7 to 12 can be played, but 7–12 is not displayed.)

Operation from the main unit

To select one of discs 1 to 6:
Press the button corresponding to the desired disc number. Do not hold it down for longer than 2 seconds.



To select one of discs 7 to 12:
Hold down the button for at least 2 seconds. Discs 7 to 12 can be selected with buttons 1 to 6. (Example: To play the disc in tray 7, press button 1 for at least 2 seconds.)



Remote controller operation

Each time the button is pressed, the disc number changes from 1 to 12.

Other operations

If this player is used in conjunction with certain multi-CD controllers, actual operations, apart from disc selection (disc number search) may be different from the description in the instruction manual of the multi-CD controller. See the following section.

Note on disc title display

If this player is used in conjunction with the KEX-M900 or DEX-M88, the title of the disc loaded in the player cannot be displayed. A digital fiber optic cable cannot be used to connect up this player.
If this player is used in conjunction with the KEX-M900RDS or DEX-M88RDS, the title of the disc loaded in the player cannot be displayed. A digital fiber optic cable cannot be used to connect up this player.

Note on program play

Program play does not work if the player is used with a KEX-M700 or KEX-M800.
Program play does not work if the player is used with a KEX-M700B, KEX-M700SDK, KEX-M800, KEX-M800SDK, or KEX-M801.

Note on last position memory

The owner's manual for the KEX-M700 controller says that the last track memory restarts play from the beginning of the track being played when the disc was stopped. But when you use one of these controllers with this player, the last position memory restarts play around the position at which the disc was stopped.
The owner's manuals for the KEX-M700B and KEX-M700SDK controllers say that the last track memory restarts play from the beginning of the track being played when the disc was stopped. But when you use one of these controllers with this player, the last position memory restarts play around the position at which the disc was stopped.

Note on random play

When using the random play feature of this player, you can get random play using up to 12 discs in the magazine. The owner's manual for the KEX-M700 controller says that random play works with only one disc. But when you use one of these controllers with this player, all 12 discs are available.
When using the random play feature of this player, you can get random play using up to 12 discs in the magazine. The owner's manuals for the KEX-M700B and KEX-M700SDK controllers say that random play works with only one disc. But when you use one of these controllers with this player, all 12 discs are available.

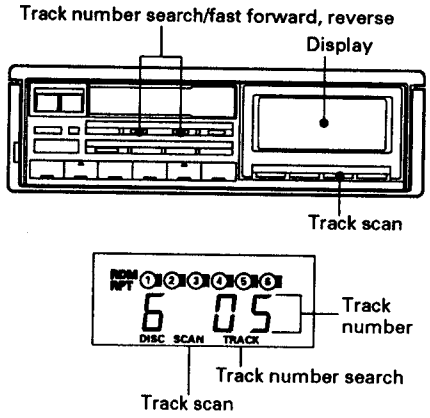
Highlight scan

KEH-M7000QR KEX-M700	KEX-M800

If this player is combined with one of the models of mentioned above car stereo, it will offer highlight scan instead of track scan. In this case, ignore the section on track scan in the owner's manuals for the player, and read the following information on highlight scan instead. (This information refers to the KEH-M7000QR player, but applied to other players, too.)

KEH-M7000SDK	KEH-M7001B
KEH-M7000B	KEH-M5000SDK
KEH-M5001B	KEH-M5000B
KEX-M800SDK	KEX-M801
KEX-M800	KEX-M700SDK
KEX-M700B	

If this player is combined with one of the models of mentioned above car stereo, it will offer highlight scan instead of track scan. In this case, ignore the section on track scan in the owner's manuals for the player, and read the following information on highlight scan instead. (This information refers to the KEH-M7000B player, but applied to other players, too.)



Using highlight scan

The highlight scan function plays one track after another for about 10 seconds each, beginning at a particular start time. Use it when searching for a piece you like. If you don't set the start time yourself, 10-second playback of each track starts one minute into each track.

1. Press the track scan button. (SCAN appears on the display).
2. Tracks will be played one after another for about 10 seconds, starting one minute into each track.
3. When you hear a track you like, press the track scan button again; the player will cancel highlight scan and continue playing the track.

- When highlight scan arrives back at the track at which it began, it is automatically cancelled and normal play resumes.

Changing the start time

Example: Setting the start time to 30 seconds into each track

1. Press the + and – sides of the track number search button at the same time. (This causes TRACK to disappear and the start time to appear on the display.)

- On the KEX-M700 model, press the track scan/fast forward and reverse button (manual) to ready the player for fast forward and reverse.
- On the KEX-M700SDK and KEX-M700B models, press the track scan/fast forward and reverse button (manual) to ready the player for fast forward and reverse.

2. Using the + and – sides of the track number search button, set the time to 30 seconds.

3. Hold the track scan button down for more than 2 seconds. (SCAN appears on the display.) The next and subsequent tracks will be played with highlight scan, starting 30 seconds into each track.

- The start time can be set in 10-second steps. A time less than 10 seconds is taken as zero.
- If the total time of a track is less than the start time, the track is played from the beginning for about 10 seconds.
- If a track lasts for less than 10 seconds after highlight scan starts, the track is just played to the end, resulting in a shorter playing time.
- It is impossible to set a start time greater than the playing time for a particular track. If you want to start a long way into each track, make sure that you use a disc with long track.

Products with which the player cannot be used

This player does not work with the following products:

CD-M1	CD-M22	CDX-FM35
CDX-FM38	DEX-M300	DPX-M200WC

This player does not work with the following products:

CD-FM1	CD-FM5	CD-M1
CD-M22	DEX-M300	DEX-M300SDK

Error Mode

If an error occurs—for example, if the CD player will not work or if it stops while playing—"ERROR" followed by an error number appears on the CD controller display. The error number indicates the cause of the error; check the items listed below.

- Some multi-CD controllers display only "ERROR", without the error number; in this case, check items 11, 14, 30 and 80 below.

Multi-CD controller display example

E–11 **Err–11** **ERR–11** **ERROR–11**

Error No.	Cause	Treatment
11, 12	Dirt or a scratch on the disc stops the laser beam from being able to focus.	Wipe off the dirt. Exchange the disc if it has been scratched.
	The disc has been inserted upside down.	Confirm that the disc has been inserted right side up.
14	The disc has been inserted upside down.	Confirm that the disc has been inserted right side up.
	An unrecorded compact disc (CD-R), which can be recorded on once is being used.	When you use a CD-R, load one that has been recorded on.
30	Dirt or a scratch on the disc hinders the track number search function.	Wipe the dirt off the disc. Exchange the disc if it is scratched.
80	There is no disc in the magazine.	Load a disc into the magazine.
A0, 10, 12, 50, 60, 70	Electrical or mechanical system fault.	See Note (*).

* Turn the car ignition switch off and on again, or press the source switch on the multi-CD controller to set CD playback again.